North-of-the-Delta Offstream Storage Preliminary Administrative Draft Environmental Impact Report

Prepared by

California Department of Water Resources

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This preliminary administrative draft of the NODOS Environmental Impact Report (EIR) has not been reviewed or approved for adequacy in meeting CEQA and NEPA requirements. The California Department of Water Resources (DWR) is releasing this document to provide decision-makers, stakeholders, and the public with up-to-date and detailed information on the investigation.

Release of this material does not constitute the initiation of formal public review of the Draft EIR as provided by CEQA Guidelines Section 15087. Although comments are welcome and may be considered in preparation of the Draft EIR, DWR will not respond to comments received on this document.

Please note the following reading guidance for this preliminary administrative draft. Refer to the summary Table of Contents for a list of chapters and appendixes. At this time, a detailed Table of Content, List of Abbreviations and Acronyms, Index, and Chapter 37, References, are not included. Abbreviations and acronyms are defined at first use in each chapter, and references are included in a References section at the end of each chapter and appendixes when necessary. Some chapters/appendixes include figures and tables at the end of the chapters/appendixes.

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ES.1 Introduction

The Preliminary Administrative Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) has been prepared by the California Department of Water Resources (DWR) and the U.S. Department of the Interior (DOI), Bureau of Reclamation, Mid-Pacific Region (Reclamation) to address the potential effects of the proposed North-of-the-Delta Offstream Storage (NODOS) Project. DWR is serving as the State lead agency for compliance with the California Environmental Quality Act (CEQA), and Reclamation is serving as the federal lead agency for compliance with the National Environmental Policy Act (NEPA). The EIR/EIS contains a description of the proposed Project, potential alternatives to the proposed Project, describes the environmental setting, identifies the potential direct and cumulative impacts that could result from implementation of each of the proposed Project's alternatives, and proposes mitigation measures for impacts found to be significant.

The proposed Project would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell, in both Glenn and Colusa counties. Other proposed Project facilities would be located in Tehama, Glenn, and Colusa counties (Figure 1-2 in Chapter 1 Introduction). DWR and Reclamation developed three variations of the preferred alternative (described as "action alternatives" in the resource chapters) to meet the purpose, need, and objectives of the proposed Project.

ES.1.1 Purpose and Need and Project Objectives

ES.1.1.1 Purpose Statement and Project Objectives

The purpose of the proposed Project is to build offstream surface storage located north of the Delta. The proposed Project's primary objectives are to:

- Improve water supply reliability for agricultural, urban, and environmental uses
- Increase survival of anadromous and endemic fish populations
- Improve environmental and drinking water quality in the Delta
- Provide flexible hydropower generation to support integration of renewable energy sources

The secondary objectives for the proposed Project, based on opportunities that were identified during formulation of alternatives that met the primary objectives, are to:

- Develop additional recreation opportunities
- Provide incremental flood damage reduction opportunities

ES.1.1.2 Needs and Project Objectives

The NODOS Project identified six needs and opportunities that are the basis of the primary and secondary objectives. The NODOS Project also identified one additional need: operational flexibility. Following is a description of the needs and opportunities identified by the NODOS Project.

<u>Water Supply Reliability for Agricultural, Urban, and Environmental Uses</u>

Water supply reliability requires the delivery of specified amounts of water at predictable locations and times. A review of DWR's SWP Delivery Reliability Reports since 2002 (2002, 2005, 2007, 2009, and 2011) indicates declining SWP reliability. Average SWP delivery has been reduced by almost

500,000 acre-feet during the period from 2002-2011. The CVP has experienced similar reductions in delivery. During prolonged droughts or multiple dry years, water supplies are reduced, and the effects of climate change are predicted to further diminish water supply. The loss of water in storage reduces the ability of the SWP and CVP to deliver the amount of water requested by their contractors, reducing the reliability of these systems to provide needed water. The additional storage provided by the proposed Project could be used to augment some of the storage capacity at existing facilities. Greater improvements to water supply reliability could be achieved if operation of the proposed Project is integrated with other storage facilities, especially during drier periods.

Survival of Anadromous and Endemic Fish Populations

Populations of anadromous and endemic fish species within the Sacramento Valley river system and Bay-Delta are declining. The primary causes of the anadromous fish species decline have been identified as barriers to historic habitat, habitat degradation, predation from introduced species, reduced instream flows, and increased water temperatures (NMFS, 2009). Several potential causes of fish species declines in the Bay-Delta have been identified, including a combination of reduced habitat suitability (such as changing salinity), reduced food sources, entrainment, invasive species, predation, and toxins (Baxter et al., 2010). Onstream dams block many of the native anadromous species from their historic spawning areas. This impact of dams is partially mitigated with cold water releases that keep the water downstream of the dams cold enough to provide limited spawning and rearing habitat. The reliability of cold water in these streams can be increased and temperatures for anadromous fish can be improved by both maintaining additional water in storage year to year and releasing additional water at specific times to improve temperatures. Additional water in storage from the proposed Project would provide a source of additional water within the SWP and CVP systems that could be used to facilitate several ecosystem restoration and enhancement actions to improve conditions for fish populations in the Delta and Sacramento River watershed.

Water Quality

The CVP and SWP systems currently meet water quality requirements by releasing additional water from upstream reservoirs. Additional water in storage from new proposed Project storage could improve Delta water quality by providing high-quality supplemental flows dedicated to Delta outflow during periods when Delta water quality is impaired. Water quality improvements would benefit drinking water quality for urban customers, irrigation users, and the Bay-Delta ecosystem.

Flexible Hydropower Generation

California's renewable energy goal is to increase the portion of energy produced by renewable sources in the State to 33 percent by 2020. Although energy from the proposed Project may not, by law, count as having been produced by a renewable electrical generation facility, operation of the Project may nonetheless provide general if unrecognized benefits in the reduction of greenhouse gas emissions by matching renewable sources with reliable and flexible generation sources to cover short-term gaps in generation, such as when winds diminish in wind generation-intensive areas. The proposed Project would be built with pumping/generating plants capable of producing hydropower. Electricity would be generated when water is released from the proposed Sites Reservoir into the proposed Holthouse Reservoir and from the proposed Holthouse Reservoir to the proposed Terminal Regulating Reservoir and into the Sacramento River. The proposed Project is also capable of daily pump-back operations. In pump-back operations mode, water would be released from the proposed Sites Reservoir into the proposed Holthouse

Reservoir during on-peak hours to generate electricity and water would be pumped back into the proposed Sites Reservoir during the off-peak hours to complete the pump-back operations cycle. Additional storage provided by the proposed Project could facilitate flexible hydropower generation, which could be quickly ramped up or down to complement wind or solar generation to meet power demands and support reliable operation of the power grid.

Additional Recreation Opportunities

The planning of any reservoir north of the Delta provides an opportunity to develop new recreational facilities and provide additional opportunities for recreation activities such as fishing, swimming, camping, boating, and hiking. The proposed Project would provide up to five new recreation areas.

Incremental Flood Damage Reduction

Offstream storage can provide incremental flood damage reduction improvements to areas located immediately downstream of the reservoir that are prone to flooding. The proposed Project would not dam a major stream, but would dam two small ephemeral creeks that are known to cause local flood damage. The proposed Project would therefore provide local flood damage reduction.

Operational Flexibility

Operational flexibility was identified as a need by both the CALFED Program and the NODOS Project. Operational flexibility can be defined as the ability of water systems to adapt and respond to changing or uncertain conditions. Water in storage is a metric of operational flexibility; increased water in storage provides increased operational flexibility for a system by allowing system operators and water managers to do more. Water managers employ the flexibility of the systems they manage to accomplish a variety of water management objectives. As noted above in the discussion of Project objectives, additional water in storage can be used to deliver more water to users, improve ecosystem conditions within the system, or improve water quality. In this sense, operational flexibility has a direct relationship with water management generally, and with meeting water management objectives specifically.

California’s water management challenges include growing drought impacts, declining ecosystems, diminishing water quality, increasing climate change impacts to the State’s hydrology, increasing flood risk, and aging infrastructure (DWR, 2009). The California Water Plan Update (DWR, 2009) notes that, “the entire system—water and flood management, watersheds, and ecosystems – has lost its resilience and is changing in undesirable ways.” This loss of resiliency is the result of decreased operational flexibility.

Additional water in new storage, such as additional water in a new offstream storage reservoir located north of the Delta, would contribute to increased system flexibility. From a system perspective, operational flexibility can be assessed by evaluating the additional water in storage that can be used to meet existing and future water demands. To achieve this kind of flexibility, additional storage would be most effective when operationally integrated with existing SWP and CVP facilities. Supplemental north of Delta storage would provide the ability to increase the water in storage in existing system reservoirs such as Shasta Lake, Lake Oroville, Trinity Lake, and Folsom Lake. The additional water in new offstream storage and increasing water levels in existing reservoirs can meet a larger set of system objectives. For example, water users and ecosystem needs immediately downstream of existing reservoirs need additional water in those reservoirs to meet those needs; additional water in new offstream storage alone would not improve the system’s ability to meet needs below existing reservoirs without integration.

The total improvement in flexibility is both additional water in existing reservoirs and additional water in new offstream storage.

ES.1.2 NODOS Study Authorizations

DWR received authorization to study NODOS Project beginning in 1996. Reclamation received feasibility study authority for the NODOS Project in 2003. The specific federal and State authorities for study of NODOS Project are summarized in Table ES-1.

Table ES-1
Summary of Federal and State Authorities for the NODOS Project

Federal Authorities	State of California Authorities
• Public Law 108-7. Consolidated Appropriations Resolution, 2003 • Public Law 108-137. Energy and Water Development Appropriations Act, 2003 • Public Law 108-361. CALFED Bay-Delta Authorization Act, 2004	• Proposition 204. The Safe, Clean, Reliable Water Supply Act of 1996 • Budget Act, 1997-1998 • Proposition 50. Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 • Proposition 84. 2006 Safe Drinking Water Bond Act

ES.1.3 Purpose and Intended Uses of this EIR/EIS

The purpose of this EIR/EIS is to present the process and overall findings of the NODOS environmental evaluations. This EIR/EIS, and the associated Draft Feasibility Report, is intended to be used by DWR and Reclamation when considering approval of the proposed Project. It will also provide information for DWR, Reclamation, National Marine Fisheries Service (NOAA Fisheries), U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW) to support compliance with the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), and the Natural Community Conservation Planning Act (NCCPA) and will provide information for the U.S. Army Corps of Engineers (USACE) and the Regional Water Quality Control Board (RWQCB) in Clean Water Act (CWA) Section 408, 404, and 401 applications, as well as information necessary for USACE to issue a Rivers and Harbors Act Section 10 permit.

ES.1.4 Federal, State, Regional, and Local Requirements

In addition to DWR and Reclamation, several federal, State, regional, and local agencies, as well as decision-making bodies, have jurisdiction over resources that could be affected by the proposed Project, or have other permitting or regulatory authority over certain aspects of the proposed Project. These agencies and decision makers will review and consider the information contained in the final EIR/EIS, and will consider it in their decision-making process. Refer to Table 1-1 in Chapter 1 Introduction for key consultation requirements for the NODOS Project.

All federal, State, regional, and local legislation and policies that were considered during impact evaluations for each of the resource chapters, or that will be used for decision making for the proposed Project, are detailed in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

ES.1.5 Notice of Preparation and Notice of Intent

DWR filed a Notice of Preparation (NOP) with the State Clearinghouse on November 5, 2001, and Reclamation published a Notice of Intent (NOI) in the *Federal Register* on November 9, 2001 to announce the intent to prepare a joint EIR/EIS for the proposed Project. The NOP/NOI notified the public of the Project proposal, announced the dates and locations of public meetings, and solicited public comments to help guide development of the EIR/EIS, pursuant to CEQA and NEPA, respectively. Copies of the NOP and NOI are included in Appendix 36A.

ES.1.6 Proposed Project

The proposed Project would consist of a new offstream surface storage reservoir with two main dams, up to nine saddle dams, and up to five recreation areas. The reservoir would have an associated inlet/outlet structure and would be connected to the Sacramento River by two existing canals and a new pipeline. Water conveyance between the reservoir and the canals and pipeline would be facilitated by two new regulating reservoirs and their associated pumping/generating plants. A new transmission line would connect the pumping/generating plants and their associated electrical switchyards to an existing transmission line in the proposed Project area. New roads and a bridge would be constructed to provide access to the proposed Project facilities and over the proposed reservoir, and some existing roads would be relocated or improved. The proposed Project would require modifications to an existing canal and pumping plant. A more complete description of the proposed Project can be found in Chapter 3 Description of Proposed Project/Proposed Action and Alternatives.

ES.1.6.1 Study Areas

The proposed Project has the potential to influence SWP and CVP system operations and water deliveries over a large geographic area. To effectively evaluate the proposed Project's three action alternatives' effects on environmental resources in different geographic regions, DWR and Reclamation identified three study areas to be evaluated in this EIR/EIS: the Extended, Secondary, and Primary study areas. These three study areas are summarized below.

Extended Study Area

The Extended Study Area includes the entire service areas of the SWP and CVP and is the largest and most diverse of the three study areas, in terms of size, geography, land use, and habitat conditions. As such, it has been described and evaluated at the lowest level of detail. These two service areas are located within all or portions of the following 39 counties: Alameda, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Imperial, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, and Yolo. The proposed Project's purpose of improved water supply reliability has the potential for long-term direct and indirect effects within those two service areas. The SWP and CVP service areas included in the Extended Study Area are shown on Figure 1-6 in Chapter 1 Introduction. The Extended Study Area would also include wildlife refuges that could receive Level 4 water supply from the proposed Project. Those wildlife refuges, which are located within seven counties in the Extended Study Area, are shown on Figure 1-7 in Chapter 1 Introduction.

Secondary Study Area

The Secondary Study Area is smaller than the Extended Study Area and has been described and evaluated in more detail than for the Extended Study Area. The Secondary Study Area is defined as the area of potential operational effects, including SWP and CVP facilities that could experience reservoir water surface elevation fluctuations and stream flow changes downstream from their facilities. Those facilities are located within the following 22 counties: Alameda, Butte, Colusa, Contra Costa, Del Norte, El

Dorado, Glenn, Humboldt, Marin, Placer, Sacramento, San Francisco, San Mateo, Santa Clara, Shasta, Solano, Sonoma, Sutter, Tehama, Trinity, Yolo, and Yuba. Operational changes could occur as a result of the coordinated and integrated operation of the proposed Project's facilities with those State and federal projects located on the American River, Trinity River, Sacramento River, Clear Creek, Spring Creek, Feather River, and the Delta. The Secondary Study Area is shown on Figure 1-8 in Chapter 1 Introduction.

Primary Study Area

The Primary Study Area is the focus of the resource evaluations in this EIR/EIS. The Primary Study Area includes the areas within Glenn and Colusa counties where short-term and long-term direct effects from constructing, operating, and/or maintaining proposed Project facilities may occur. This study area includes the footprints of the proposed Sites Reservoir inundation area and other proposed facilities (e.g., dams, intakes/discharge facilities, pipelines, transmission line, pumping/generating plants, recreation areas, road relocation areas, borrow areas and associated facilities). It also includes the construction disturbance areas, i.e., the footprint of each proposed facility plus the area around each facility that would be disturbed over the short-term by Project-related construction activities, vehicles, and equipment. The Primary Study Area also includes the land parcels that surround those Project facilities; these parcels would be purchased but not developed for the proposed Project and are referred to as the "Project Buffer."

There are differences in the facilities associated with the proposed Project alternatives; therefore, the Primary Study Areas for the three alternatives also differ. The Primary Study Areas associated with Alternatives A, B, and C are shown on Figure 1-9A, Figure 1-9B, and Figure 1-9C, respectively, in Chapter 1 Introduction.

ES.1.7 Areas of Controversy/Issues to be Resolved

The following areas of controversy and issues to be resolved have been identified to date through stakeholder meetings or during the preparation of this EIR/EIS.

- Golden eagles have been identified as foraging within the proposed Sites Reservoir Inundation Area and nesting within the proposed recreation areas. USFWS has expressed concern about the potential loss of nesting and foraging habitat for golden eagles, which are protected by the Bald and Golden Eagle Protection Act.
- Project development would require the demolition of existing structures, acquisition of private property, and relocation of displaced parties. These actions concern property owners within the Primary Study Area.

ES.2 Approach to Alternatives Analysis

ES.2.1 Overview of the Alternatives Analysis

The NODOS Project alternatives analysis was completed in phases. The study of the NODOS Project was originally derived from the CALFED Program's identification of a range of activities that, if implemented, could concurrently improve the quality and reliability of California's water supplies as well as ecosystem conditions and levee integrity in the Sacramento-San Joaquin Delta. Among many recommended activities, the CALFED Program identified the need for an additional 3.0-MAF of storage north of the Delta to meet environmental and water supply needs. The CALFED Program also expressed a preference for offstream over onstream storage to avoid redirected impacts to fisheries and other aquatic species. The CALFED Program initially identified 52 potential surface storage locations[1] but retained only 12 reservoir locations statewide for further study (CALFED, 2000). For a summary of the CALFED Program Inventory of Potential Surface Water Storage Sites, refer to Appendix 2A. Red Bank, Newville, Colusa, and Sites are four (of the 12) reservoir locations that are offstream and located north of the Delta. Consistent with these recommendations, DWR initiated studies of the four north-of-the-Delta offstream storage alternatives in 1997.

The consideration and evaluation of the four alternatives is described below. DWR and Reclamation eliminated the Red Bank and Colusa alternatives from further consideration based upon a comparison of environmental effects and feasibility considerations, which are documented in the 2000 NODOS Investigation Progress Report and in the 2006 NODOS Initial Alternatives Information Report. This allowed DWR and Reclamation to compare and evaluate the No Project/No Action Alternative, the Newville Reservoir Alternative, and the Sites Reservoir Alternative in greater detail, consistent with NEPA and CEQA requirements. Based on the detailed evaluation of these alternatives, Sites Reservoir was selected as the preferred proposed Project alternative.

DWR and Reclamation have also completed a more detailed evaluation of effects, consistent with CEQA and NEPA requirements, of three configurations of Sites Reservoir, hereafter called Alternative A, Alternative B, and Alternative C. The results and conclusions of these evaluations are found in Chapters 6 through 35. For purposes of CEQA, these alternatives should be considered as three variations of the Sites Reservoir Alternative (i.e. the preferred Project alternative). For NEPA purposes, the evaluation of Alternative A, Alternative B, Alternative C, and the No Project/No Action Alternative were evaluated in detail in accordance with the Council on Environmental Quality regulation 1502.14b.

ES.2.2 Alternatives Considered But Rejected from Further Consideration

Following an evaluation of the NODOS Investigation Progress Report (July 2000), the Red Bank and Colusa alternatives were eliminated from further consideration. The reasons for eliminating these two reservoir locations are described in further detail in Chapter 2 Alternatives Analysis. The Red Bank Alternative was eliminated because it was determined early in the evaluation process that a reservoir at Red Bank would have more numerous and more significant impacts to the physical environment than other alternatives. Relative to other alternatives, Red Bank would have a larger on-stream component, would impact lands with greater habitat diversity, would substantially reduce sediment contributions from Cottonwood Creek to the Sacramento River, and would result in significant impacts to spring-run Chinook salmon and steelhead on South Fork Cottonwood Creek. Furthermore, the level of overall benefits (water supply, water quality, ecosystem enhancement, hydropower) realized by the Red Bank Alternative would be less than that of other locations considered due to the smaller storage capacity of the reservoir. The Colusa Reservoir Alternative was not recommended for further consideration because its larger facilities would have an overall greater impact on environmental and cultural resources than the other smaller reservoir alternatives, its high total capital cost for storage capacity made it the least cost effective alternative, and the estimated average annual cost per yield would be comparatively excessive.

[1] The results of this inventory are presented in the March 7, 1997 draft report, *CALFED Bay-Delta Program Storage and Conveyance Component Inventories*. The inventory includes 51 potential surface water storage sites. Subsequently, the August 2000 *CALFED Initial Surface Water Storage Screening Report* added the San Luis Enlargement to the list of potential sites.

ES.2.3 Alternatives Selected for Analysis

DWR and Reclamation selected the Sites Reservoir and Newville Reservoir alternatives, along with the No Project/No Action alternative, for further analysis in the NODOS Project EIR/EIS. DWR's NOP and Reclamation's NOI also identified other potential alternatives, including conjunctive use or Shasta Reservoir enlargement, either as stand-alone projects or in conjunction with other NODOS Project alternatives to meet NODOS Project objectives. Subsequent evaluations by other programs determined that the potential for conjunctive use is limited because Sacramento Valley groundwater basins recharge annually, leaving no space for operable storage. Conjunctive use was, therefore, not retained as a feasible alternative.

Reclamation is investigating Shasta Lake enlargement as part of its Shasta Lake Water Resources Investigation. However, State agency involvement in this project is effectively barred by Public Resources Code section 5093.542. Shasta Lake enlargement was, therefore, not retained as a feasible alternative to meet NODOS Project objectives. The alternatives retained for further analysis are briefly described below and described in further detail in Chapter 2 Alternatives Analysis.

ES.2.3.1 Existing Conditions and the No Project/No Action Alternative

The CEQA Baseline for assessing significance of impacts of the proposed Project is normally the environmental setting, or Existing Conditions, at the time a NOP is issued. The NOP for the proposed Project was published on November 5, 2001. However, because the preparation of this environmental document has occurred over many years, it was deemed necessary to update the baseline condition date to June 2009 to include programs, projects, or policies that have been implemented during the document's preparation. Changes in the regulatory environment since November 2001 have fundamentally changed water management in California and necessitate updating the baseline conditions for environmental analyses in this EIR/EIS. These changes include the issuance of new biological opinions (BO) by the U. S. Fish and Wildlife Service (USFWS) in December 2008 and the National Marine Fisheries Service (NMFS) in June 2009 on the operations of the State Water Project and Central Valley Project. Consequently, June 2009 (following the release of NMFS' BO) was selected as the proposed Project's Existing Conditions date.

CEQA requires an analysis of an alternative in which the proposed Project is not implemented, referred to as the No Project Alternative. No Project conditions include reasonably foreseeable changes in Existing Conditions and changes that would be reasonably expected to occur in the foreseeable future if the project were not implemented, based on current plans and consistent with available infrastructure and community services. NEPA also requires an analysis of an alternative in which the proposed Project is not implemented, referred to as the No Action Alternative. The No Action Alternative represents a projection of current conditions to reasonably foreseeable future conditions that could occur if the proposed Project or alternatives are not implemented.

The No Action Alternative assumptions are consistent with the requirements and limitations prescribed by CEQA; therefore, in this EIR/EIS, the No Action Alternative also represents the No Project Alternative. The No Project/No Action Alternative assumptions include the assumptions related to the State Water Project (SWP) and Central Valley Project (CVP), ongoing programs and policies by governmental and nonprofit entities, and assumptions related to annual actions that vary every year. The No Project/No Action Alternative includes projects and programs with clearly defined management and/or operational plans, including facilities being constructed as of June 2009[2]. The No Project/No Action Alternative also includes projects and programs that received approvals and permits in 2009 to remain consistent with existing management direction. Those actions are consistent with the continuation of existing management direction or level of management for plans, policies, and operations by the lead agencies and other agencies. Refer to Chapter 2 Alternatives Analysis for the key assumptions associated with the No Project/No Action Alternative, as well as summaries of the following:

- SWP and CVP operations included in the No Project/No Action Alternative (Table 2-11 in Chapter 2 Alternatives Analysis)
- Projects and programs included in the No Project/No Action Alternative (Table 2-12 in Chapter 2 Alternatives Analysis)
- Ongoing programs included in the No Project/No Action Alternative (Table 2-13 in Chapter 2 Alternatives Analysis)

ES.2.3.2 Sites Reservoir Alternative

The Sites Reservoir Alternative, which would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell in Glenn and Colusa counties, would be formed by constructing two major dams on Stone Corral Creek and Funks Creek. Initial evaluation of the Sites Reservoir Alternative focused on a 1.81-MAF reservoir that would also require the construction of nine saddle dams along the southern edge of the Hunters Creek watershed. Diversions from the Colusa Basin Drain (CBD), the Sacramento River, and local tributaries could provide potential sources of water supply for Sites Reservoir. Multiple conveyance options would be possible, with 13 optional conveyance systems (using existing and new conveyance infrastructure) from the Sacramento River, two from CBD, and two from Stony Creek. The description for the Sites Reservoir Alternative was further developed to include details for the appurtenant facilities shown in Figures 2-2 and 2-3 in Chapter 2 Alternatives Analysis.

Non-irrigation season flows in the CBD, the Sacramento River, and local tributaries remained potential sources of water supply for the offstream Sites Reservoir Alternative. Potential conveyance systems from these sources to the reservoir included existing and/or enlarged Tehama-Colusa (T-C) and Glenn-Colusa Irrigation District (GCID) canals, or a new conveyance facility from the Sacramento River near Moulton Weir and/or from the CBD to the existing Funks Reservoir on the T-C Canal. Conveyance from Stony Creek was also considered. All conveyance alternatives required enlargement of the existing Funks Reservoir to provide adequate storage capacity for pumping of water into the reservoir and hydropower generation. Major project facilities would be situated near the Funks Creek damsite, including outlet works, power plant, intake structure, and maintenance facilities. Additionally, up to five potential recreation facility locations were identified to meet the secondary objective of developing additional recreation opportunities in the study area.

ES.2.3.3 Newville Reservoir Alternative

The Newville Reservoir Alternative would be located upstream from Black Butte Reservoir, approximately 18 miles west of the City of Orland and 23 miles west-southwest of the City of Corning in Glenn and Tehama counties. Alternative reservoir sizes of 1.9-MAF and 3.0-MAF were considered. The 1.9-MAF reservoir would be formed by a dam on North Fork Stony Creek and a saddle dam at Burrows

[2] The lead agencies have established June 2009 as the Existing Conditions date; it is characterized in Chapters 6 through 31 as the Environmental Setting/Affected Environment discussion.

Gap. The 3.0-MAF reservoir would require up to five additional saddle dams and a dike. A small diversion dam and diversion from Thomes Creek would transfer water to the reservoir. Other source options include Stony Creek and the Sacramento River. Multiple conveyance options would be possible using existing infrastructure (e.g., canals), new infrastructure (e.g., canals, tunnels, and/or pipelines), or a combination of new and existing facilities. The description for the Newville Reservoir Alternative was refined further to include details for the appurtenant facilities shown in Figures 2-4, 2-5, 2-6, and 2-7 in Chapter 2 Alternatives Analysis. Continued evaluation of the Newville Reservoir Alternative focused on the 1.9-MAF reservoir size. The Sacramento River and Black Butte Reservoir were considered, in addition to Thomes Creek, as potential sources of water supply for the Newville Reservoir Alternative. Potential conveyance systems from these sources to the reservoir included the existing or enlarged T-C Canal with a new conveyance between the GCID and T-C canals, a new conveyance from the T-C Canal to the existing Black Butte Reservoir, and a new conveyance from Black Butte Reservoir to Newville Reservoir. A new conveyance from a proposed Thomes Creek diversion at a location north and west of the Newville Reservoir Alternative was also considered. Additionally, five potential recreation areas were identified to meet the secondary objective of developing additional recreation opportunities in the study area.

ES.2.4 Preferred Proposed Project Alternative

Comparisons of the biological and cultural resources for the Sites Reservoir and Newville Reservoir alternatives indicated a greater impact potential for the Newville Reservoir Alternative. Because of the consistently higher potential for biological and cultural resources impacts associated with the Newville Reservoir Alternative, and because the Newville Reservoir Alternative would not avoid or reduce any of the significant adverse effects associated with the Sites Reservoir Alternative, DWR and Reclamation selected the Sites Reservoir Alternative as the preferred proposed Project alternative to be retained for further study and more detailed evaluation.

ES.2.4.1 Sites Reservoir Storage Alternatives

DWR and Reclamation considered various storage sizes of Sites Reservoir, including 800 TAF, 1.27 MAF, 1.81 MAF, and 2.1 MAF. These four storage sizes were selected to reflect a range of storage values that would allow for a useful comparison of the costs and benefits estimates. These four storage sizes also represent points on the cost curve where the proposed Project's costs would change significantly due to the need for new Project features, such as dams or embankments.

DWR and Reclamation determined early in the investigation that a 2.1-MAF reservoir may present significant design challenges based on a review of the reservoir rim topography, site geology, and a cursory evaluation of the relationship between embankment volume and reservoir storage. Therefore, a maximum reservoir elevation of 540 feet, corresponding to a reservoir size of 2.1 MAF, was eliminated from further consideration. Reservoir sizes of 800 TAF, 1.27 MAF, and 1.81 MAF were, therefore, carried forward for further consideration.

ES.2.4.2 Sites Reservoir Conveyance Alternatives

Preliminary operations simulations indicated that 3,000 to 6,000 cfs of total inflow capacity would be needed to reliably fill Sites Reservoir. Because Sites Reservoir would be located offstream, water would need to be delivered both to and from the reservoir. As a result, conveyance facilities would be needed to transport water to Sites Reservoir, and to deliver water from Sites Reservoir to service areas, the Sacramento River, and other locations to meet various water resources needs and uses. DWR and

Reclamation determined that, to maximize operational flexibility, the conveyance facilities would need to be able to:

- Deliver water directly from Sites Reservoir to meet local needs in the vicinity of the existing GCID and T-C canals
- Deliver water in an integrated manner with existing CVP and SWP operations to facilitate meeting additional needs throughout the Bay-Delta system.
- Release water directly to the Sacramento River to meet additional needs throughout the Bay-Delta system and provide downstream benefits for Delta water quality and water supply reliability for CVP, SWP, and Level 4 wildlife refuge water supply. Additionally, the ability to release water directly to the Sacramento River would allow Sites Reservoir to respond to Delta emergencies.

Conveyance facilities alternatives that would divert water from the Sacramento River included the existing GCID and T-C canals, and a new pipeline, known as the Delevan Pipeline. Tributary source conveyance facilities alternatives included new pipelines from the CBD and Stony Creek. Conveyance facilities alternatives that were evaluated initially had a range of capacity sizes. Each of the options for the conveyance alternatives were evaluated based on cost, the importance of providing direct release to the Sacramento River, and preliminary assessments of potential environmental and cultural resources impacts.

The conveyance options retained were:

- T-C Canal at its existing capacity of 2,100 cfs
- GCID Canal at its existing capacity of 1,800 cfs
- A new Delevan Pipeline at capacities of 1,500 cfs, 2,000 cfs, and 3,000 cfs

The T-C and GCID canals at their existing capacities would be the most cost-effective conveyance alternatives and were retained. The three smallest Delevan Pipeline alternatives were also retained as they could be combined with the T-C and GCID canals to provide conveyance packages with up to 6,900 cfs total capacity for use in initial alternative development and allowed for an evaluation of benefits associated with the proposed Delevan Pipeline's ability to return water directly to the Sacramento River.

ES.2.4.3 Sites Reservoir Operational Alternatives

Eight initial Sites Reservoir operational alternatives, each with a range of conveyance packages and operational emphases, were considered and evaluated with the CalSim-II operations model in the NODOS Plan Formulation Report (DWR and Reclamation, 2008). The operational alternatives assumed a Sites Reservoir storage size of 1.8 MAF. All of the initial Project operational alternatives evaluated met the proposed Project's primary objectives, but to varying degrees. The proposed Project operational alternative that emphasized a balanced mix of benefits to water supply reliability, water quality, and ecosystem enhancement generated the greatest net annual economic benefit and minimized environmental impacts, and therefore was selected as the operational scenario for detailed evaluation in this environmental document. This operational alternative was the only one evaluated that resulted in economic benefits that exceeded costs (i.e. benefit-cost ratio greater than 1.0). The other operational alternatives that prioritized one benefit category (i.e. water supply reliability, water quality, or ecosystem enhancement) were eliminated from further consideration.

ES.2.4.4 Sites Reservoir Storage, Conveyance, and Operations Formulation

Based on the initial evaluation of storage, conveyance and operational alternatives, the following proposed Project features were retained for further evaluation:

- Sites Reservoir Storage: 800 TAF, 1.27 MAF, and 1.81 MAF
- Sites Reservoir Conveyance: Existing T-C Canal (2,100-cfs capacity), existing GCID Canal (1,800-cfs capacity), and new Delevan Pipeline (1,500-cfs, 2,000-cfs, and 3,000-cfs capacity)
- Operational scenario that emphasized a balanced mix of benefits to water supply reliability, water quality, and ecosystem enhancement

To further evaluate and optimize reservoir storage and conveyance options, preliminary costs were estimated and operations modeling was performed. Based on preliminary operations simulations, a 3,000-cfs Delevan Pipeline was eliminated from consideration. Modeling results of the above-listed conveyance options indicated that a 2,000-cfs conveyance was adequate to meet the proposed Project objectives. A preliminary estimate was made of the net annual benefit associated with each reservoir storage and conveyance options combination that was retained. Based on the analysis, three reservoir size and conveyance options were combined with new hydropower facilities to develop three configurations of Sites Reservoir, hereafter referred to as Alternative A, Alternative B, and Alternative C in this EIR/EIS. Following is a brief description of the No Project/No Action Alternative and Alternatives A, B, and C that are evaluated in this EIR/EIS:

- **No Project/No Action Alternative.** The No Project/No Action Alternative assumes that no actions would be taken to provide storage north of the Delta to improve water supply reliability, to enhance the survivability of anadromous fish or drinking water quality in the Delta, or to improve flexible hydropower generation.
- **Alternative A – 1.27-MAF Sites Reservoir with Delevan Pipeline.** Alternative A includes a 1.27-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals and a new Delevan Pipeline (2,000-cfs diversion/1,500-cfs release). This alternative also includes new hydropower facilities.
- **Alternative B – 1.81-MAF Sites Reservoir with Release-only Delevan Pipeline.** Alternative B includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals, and a new release-only Delevan Pipeline (1,500-cfs release). This alternative also includes new hydropower facilities.
- **Alternative C – 1.81-MAF Sites Reservoir with Delevan Pipeline.** Alternative C includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals and a new Delevan Pipeline (2,000-cfs diversion/1,500-cfs release). This alternative also includes new hydropower facilities.

ES.2.5 Proposed Project Action Alternatives

Table ES-2 provides a summary list of proposed Project facilities for each action alternative.

Table ES-2
Proposed Project Features by Action Alternative

Project Feature	Component of Alternative A	Component of Alternative B	Component of Alternative C
1.27-MAF Sites Reservoir (requires 9 dams total)	Yes	No	No
1.81-MAF Sites Reservoir (requires 11 dams total)	No	Yes	Yes
Golden Gate and Sites Dams	Yes	Yes	Yes
9 Saddle Dams	No	Yes	Yes
7 Saddle Dams	Yes	No	No
Up to 5 Recreation Areas	Yes	Yes	Yes
Road Relocations and South Bridge	Yes	Yes	Yes
Sites Pumping/Generating Plant	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 3,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity
Electrical Switchyards	Yes	Yes	Yes
Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Field Office Maintenance Yard	Yes	Yes	Yes
Holthouse Reservoir Complex (includes Holthouse Reservoir and Dam, breached Funks Dam, existing Funks Reservoir Dredging, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, T-C Canal Bypass Pipeline, and Holthouse to T-C Canal Pipeline)	Yes	Yes	Yes
Pump Installation at the Red Bluff Pumping Plant	Yes	Yes	Yes
GCID Canal Facilities Modifications	Yes	Yes	Yes
GCID Canal Connection to the Terminal Regulating Reservoir (TRR)	Yes	Yes	Yes
TRR (includes the TRR to Funks Creek Pipeline and Outlet)	Yes	Yes	Yes
TRR Pumping/Generating Plant	Yes	Yes	Yes

Table ES-2
Proposed Project Features by Action Alternative

Project Feature	Component of		
	Alternative A	**Alternative B**	**Alternative C**
TRR Pipeline (3.5-mile-long pipeline to convey water from the TRR to Holthouse Reservoir) and TRR Pipeline Road	Yes	Yes	Yes
Delevan Transmission Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E[3] Line plus WAPA/PG&E Line to Sacramento River	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line plus WAPA/PG&E Line to Sacramento River
Delevan Pipeline (2,000 cfs with 2 pipelines)	Yes	Yes	Yes
Delevan Pipeline Intake Facilities (includes fish screen and pumping/generating facilities)	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity	No	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity
Delevan Pipeline Discharge Facility	No	Yes; 1,500 cfs release capacity	No
Project Buffer	Yes	Yes	Yes
Potential Acreage of Temporary Land Use Impacts	17,680	19,637	19,636
Potential Acreage of Permanent Land Use Impacts	26,425	26,424	26,425

The following are Project-related ecosystem enhancement actions common to all action alternatives:

- Ecosystem Enhancement Storage Account—Operational Actions
- Ecosystem Enhancement Fund—Nonoperational Actions

Ecosystem enhancement actions have been designed to support the NODOS Project objective of increased fish survival. Based upon recommendations from federal and State fish agencies, the proposed Project would provide operational and nonoperational ecosystem enhancement actions. Conceptually, the operational and non-operational actions would be most effective if implemented concurrently. These proposed Project facilities, operational and non-operational actions, and proposed seasonal schedule for Project operations are discussed in further detail in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives.

ES.3 Summary of Potential Environmental Effects and Mitigation Commitments

Project operations were developed by DWR and Reclamation in coordination with State and federal resource agencies and local water interests to maximize a broad array of Project benefits (objectives) and minimize or avoid Project-related adverse effects. The operations evaluated in this environmental document represent an operational scenario designed to concurrently maximize achievement of the

[3] The proposed Project would connect with either the existing PG&E Transmission Line or the existing WAPA Transmission Line.

Project objectives of improving water supply reliability, increasing the survival of anadromous fish, improving Delta water quality, and providing flexible hydropower generation. The impact analyses included in the resource chapters assess Sites Reservoir and the potential response of CVP and SWP facilities under each alternative using this single operational scenario.

The proposed Project action alternatives would affect environmental resources in all three study areas. Some of the impacts would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation. Other impacts would be permanent, some of which would remain significant and unavoidable despite proposed mitigation measures. In addition, some effects of the proposed Project would be beneficial.

Table ES-3 (provided at the end of this chapter) summarizes the impacts by environmental resource for each proposed Project alternative, the level of significance of the impact prior to mitigation, the proposed mitigation measure, and the level of significance of the impact after mitigation.

ES.3.1 Identified Significant and Unavoidable Impacts

As shown in Table ES-3, the proposed Project action alternatives would likely result in the following potentially significant and unavoidable direct and indirect impacts.

ES.3.1.1 Botanical Resources

Two plant species with suitable habitat around the proposed Sites Reservoir footprint edges were likely not adequately included in the reservoir footprint surveys of 1998-99, and therefore, may occur within the footprint: *Amsinckia lunaris* (CNPS List 1B) and *Sidalcea keckii* (CNPS List 1B and federally endangered). Construction of the proposed Sites Reservoir and Dams could therefore result in the loss of these species, as well as the loss of some CNPS List 4 species, for which mitigation measures may not be adequate to reduce impacts to less than significant levels.

ES.3.1.2 Terrestrial Biological Resources

Construction and filling of the proposed Sites Reservoir Inundation Area, as well as construction of the proposed Recreation Areas, would result in the permanent loss of foraging and nesting habitat for the golden eagle. Pursuant to the Bald and Golden Eagle Protection Act, implementation of mitigation measures would not reduce this impact to less than significant levels.

ES.3.1.3 Cultural Resources

Increased water level fluctuations at San Luis Reservoir and other service area reservoirs associated with proposed Project operations could impact significant archaeological sites, traditional cultural properties, or human remains. Because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted, it is possible that mitigation measures would not reduce this impact to less than significant levels. Construction of the proposed Project facilities would affect built environment resources. If these resources are determined to be eligible for listing in the California Register of Historical Resources or National Register of Historic Places, mitigation measures would not reduce the impact to less than significant levels.

ES.3.1.4 Land Use

Construction and filling of the proposed Sites Reservoir Inundation Area would result in the physical division of the community of Sites, resulting in a significant and unavoidable impact. Construction of the proposed Project facilities would result in conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts. Implementation of mitigation measures may not reduce these impacts to less than significant levels.

ES.3.1.5 Air Quality

Construction activities associated with all proposed Primary Study Area Project facilities, as well as activities (such as use of roads, recreation, electricity generation and consumption, and sediment dredging) associated with the long-term operation and maintenance of the proposed Project, would result in significant and unavoidable emissions of PM_{10}, ROG, and NO_x.

ES.3.1.6 Climate Change and Greenhouse Gas Emissions

Increased electricity use associated with Project-related changes in CVP operations would be served by energy generated at CVP hydroelectric facilities that emit no GHGs and consequently would result in a corresponding reduction in supply of GHG-emissions-free electricity available to sell to California's electricity users. Substitute electricity supplies for this reduction may result in GHG emissions that would have a cumulatively considerable effect. Monitoring to measure the indirect change in emissions would not be feasible; mitigation would also therefore not be feasible.

ES.3.1.7 Visual Resources

The proposed South Bridge, Terminal Regulating Reservoir (TRR), and associated TRR facilities would be visually dominant and in high contrast to the surrounding landscape, resulting in a significant and unavoidable impact on a scenic vista. In addition, the proposed Sites Reservoir would have a significant impact on a scenic vista when water levels are drawn down during Dry to Critical water years and during some late summer months. The proposed Sites Reservoir and the proposed Road Relocations would impact large contiguous areas of grazing land and the proposed TRR and associated facilities would be visually intrusive due to their scale and designed height, causing substantial degradation of the existing visual character of the site. The large water surface of the proposed Sites Reservoir would also introduce a substantial new potential source of daytime and nighttime glare in the area.

ES.3.2 Short-Term Uses vs. Long-Term Productivity

NEPA requires consideration of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity of the affected resources for a Proposed Action.

Implementation of any of the proposed Project action alternatives would require the construction of new facilities, improvements to existing facilities, the demolition of existing structures, removal of existing roads, and the inundation of lands. These activities would result in short-term and long-term impacts on the resources evaluated in this EIR/EIS.

Potential benefits of proposed Project implementation include improved water supply reliability for agricultural, urban, and environmental uses, and for Delta emergency response; increased survival of anadromous and endemic fish populations; improved drinking and environmental water quality in the Delta; increased flexible hydropower generation to support integration of renewable energy sources; improved local flood damage reduction; and increased recreational opportunities. Environmental uses and habitat for a variety of aquatic and terrestrial species along the Sacramento River and waterways within the study areas would also be maintained, and potentially enhanced, through the proposed ecosystem enhancement storage account, and the proposed ecosystem enhancement fund. All of the action alternatives would also result in indirect and induced employment, as discussed in the Growth Inducing Impacts section. In addition, sales and profits for businesses that support the construction industry in the Primary Study Area would result in increased profits for the duration of the construction period.

In summary, the long-term benefits of the improved operational flexibility of the State's water system would outweigh the short-term and long-term adverse effects on the individual resources areas evaluated in this DEIS/EIR.

ES.3.3 Irreversible or Irretrievable Commitments

CEQA requires a discussion of the significant irreversible environmental changes that would be caused by the proposed Project should it be implemented. In addition, an EIS prepared under NEPA must analyze irreversible and irretrievable commitments of resources (NEPA Section 102(2)(c)(v) and 40 CFR 1502.16). Reclamation and other federal agencies have interpreted irreversible and irretrievable commitments to mean the use of nonrenewable resources and the effects this use would have for future generations. Irreversible commitment of resources occurs as a result of the use or destruction of a specific resource (e.g., minerals extraction, destruction of cultural resources) which cannot be replaced or, at a minimum, restored over a long period of time. Irretrievable commitment of resources refers to actions resulting in the loss of production, harvest, or use of natural resources. It represents opportunities foregone for the period of time that a resource cannot be used (e.g., land conversion to new uses; construction of levees preventing the natural flooding of flood plains). In other words, the production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production. Irretrievable commitments of resources are evaluated to assure that proposed consumption is justified.

The commitment of resources would generally be similar for all of the proposed Project's action alternatives. The proposed Project would result in the irreversible and irretrievable commitment of the following resources during Project construction, operation, and maintenance:

- Construction materials, including wood, rock, soil and metal
- Energy expended in the form of electricity, gasoline, diesel fuel, oil, and lubricants for equipment and transportation vehicles that would be needed for Project construction, operation, and maintenance
- Construction labor
- Permanent changes in land use, including the conversion of prime agricultural land to other uses and the relocation of graves, at proposed Project facility locations due to land that would be committed to new and modified Project facilities and land areas inundated with water
- Changes in the visual resources and landscape character of lands where proposed Project facilities would be located, including large structures and new sources of light
- Effects on biological and cultural resources located at proposed Project facility locations, including vegetation removal, the disturbance of traditional cultural practices, and the disturbance of cultural resources potentially eligible for listing on the California Register of Historical Resources and the National Register of Historic Places

Some of these resources that would be used for the proposed Project are nonrenewable resources and are considered irretrievably and irreversibly committed because reuse is not possible or is highly unlikely.

However, nonrenewable resources are expected to account for a minimal portion of the region's resources and the proposed Project's use of nonrenewable resources would not affect the availability of these resources for other needs within the region.

CEQA Guidelines Section 15126.2 (c) also states that irreversible environmental damage can result from environmental accidents associated with a project. Construction of the proposed Project would result in the use, transport, storage, and disposal of hazardous wastes. DWR and Reclamation would require all construction, operation, and maintenance activities to comply with applicable federal, State, and local laws related to hazardous materials, which would significantly reduce the likelihood and severity of accidents that could cause irreversible environmental damage as a result of proposed Project construction, operation, and maintenance. In addition, the proposed Sites Reservoir dams would be designed and constructed pursuant to conservative guidelines and criteria designed to prevent failure.

ES.3.4 Growth-Inducing Impacts

Implementation of the proposed Project would improve water supply reliability for agricultural, urban, and environmental uses; improve water quality; provide more options for water management; increase recreational opportunities; and increase temporary and permanent employment opportunities. These Project-related changes would not be expected to result in growth-inducing effects for the following reasons.

ES.3.4.1 Improved Water Supply Reliability and Water Quality for Agricultural, Urban, and Environmental Uses

The expected increase in water yield associated with Project implementation would be within the range of projected increases of water supplies by major urban water users in their recent Urban Water Management Plans (UWMPs) to provide adequate water supplies for planned growth. Because the UWMPs have identified adequate water supplies to meet future water demands in 2030 for the Long-Term average and Dry and Critical Dry year conditions, it does not appear that lack of water supplies is an obstacle to growth in these major urban communities. Project-related increased water supply reliability is therefore not expected to be growth inducing.

The expected increased water deliveries to agricultural water users in the Extended Study Area, which would range from zero to five percent, are not expected to be growth inducing, and could reduce the potential to change adopted land use plans that would allow conversion of agricultural lands to urban uses.

ES.3.4.2 Increased Recreational Opportunities

Expected Project-related increased recreation expenditures would represent less than 0.2 percent of total industrial expenditures in the Primary Study Area and are therefore not anticipated to increase growth within the entire Primary Study Area. However, increased recreation use could adversely affect public services due to increased traffic. The expected increase in traffic would result in a less-than-significant impact with implementation of mitigation measures.

ES.3.4.3 Increased Employment Opportunities

The expected magnitude of Project-related increased employment opportunities in the agricultural sector would be less than one percent, when compared to the regional economy of the Extended Study Area, and is therefore not anticipated to result in growth-inducing impacts. Although the expected increased water supply deliveries could result in increased employment and other economic benefits, the effects on housing and population are expected to be minor in the Extended Study Area, when compared to the total housing and population.

Project construction and operation would be expected to result in a minor increase in jobs and population in the Primary Study Area, which could be accommodated within available housing units. An adequate housing supply exists to accommodate the change in population, and as such, this expected increase associated with Project implementation is not anticipated to be growth inducing.

ES.3.5 Cumulative Impacts

The California Code of Regulations' Guidelines for the Implementation of the California Environmental Quality Act (CEQA Guidelines) and federal National Environmental Policy Act (NEPA) regulations require that the cumulative impacts of a proposed project be addressed in an Environmental Impact Report/Environmental Impact Statement (EIR/EIS). Cumulative impacts are impacts on the environment that result from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions.

The cumulative impact assessment for the proposed Project considered projects and programs identified under Existing Conditions (which includes the current effects of past projects) and reasonably foreseeable and probable future projects. The criterion for considering whether a project was reasonably foreseeable and probable in this EIR/EIS was whether the project had been defined in adequate detail, either through the completion of publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents, to estimate potential impacts.

Projects considered in the cumulative impacts analysis included 11 multi-region projects and actions; two local agency projects and actions in the vicinity of the proposed NODOS Project facilities; 24 water supply, water quality, and hydropower projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations; and 21 ecosystem improvement projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations (refer to Chapter 35 Cumulative Impacts for the names descriptions of each of project considered).

Implementation of the proposed Project would result in the cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect for the following resources.

ES.3.5.1 Botanical Resources

Adverse effects due to loss of vegetation within the inundation area of the proposed Sites Reservoir and within and adjacent to the inundation area of the proposed Holthouse Reservoir would potentially remain substantial and unavoidable following implementation of mitigation measures; in addition, the loss of botanical resources associated with some future projects in the Extended and Secondary study areas would be substantial and unavoidable

ES.3.5.2 Terrestrial Biological Resources

Adverse effects due to the loss of golden eagle nesting and foraging habitat within the inundation area of the proposed Sites Reservoir and some of the proposed Recreation Areas would remain substantial and unavoidable following implementation of mitigation measures; in addition, the loss of wildlife habitat associated with some future projects in the Extended and Secondary study areas would be substantial and unavoidable

ES.3.5.3 Cultural Resources

Project-related water level fluctuations in the Extended Study Area could result in substantial effects to cultural resources because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted; construction of the proposed Project facilities would result in potentially substantial and unavoidable effects to historic resources and traditional cultural properties; in addition, effects to cultural and historical resources due to disturbance or inundation from future projects within the Extended and Secondary study areas would be substantial and unavoidable

ES.3.5.4 Land Use

Construction of the proposed Project facilities would result in conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, which could remain substantial and unavoidable; the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect; in addition, future projects within the Extended and Secondary study areas would result in substantial and unavoidable changes in land uses and loss of agricultural lands

ES.3.5.5 Recreation Resources

Potential Project-related operational changes could result in reduced water surface elevations at San Luis Reservoir; in addition, future projects within the Extended and Secondary study areas could contribute to further reductions in summer water storage elevations and flows in rivers downstream of the CVP and SWP reservoirs

ES.3.5.6 Air Quality

Construction of the proposed Project facilities would result in substantial and unavoidable effects to air quality; in addition, future projects within the Extended and Secondary study areas would result in substantial and unavoidable effects to air quality

ES.3.5.7 Climate Change and Greenhouse Gas Emissions

Proposed Project operation would require a small increase in electricity usage to operate the CVP and would consequently reduce supply of GHG-emissions-free electricity available to sell to California electricity users - because it is unknown which type of power source would be used to substitute for the lost power, the proposed Project could result in potentially substantial and unavoidable effects to GHG emissions; in addition, operation of future projects within the Extended and Secondary study areas would result in potentially substantial and unavoidable effects to GHG emissions because it is unknown which type of power source would be used to provide the additional electricity needed for those projects

ES.3.5.8 Visual Resources

Substantial and unavoidable Project-related effects to visual resources would occur due to glare from the water surface of the proposed Sites Reservoir, changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure such as the proposed South Bridge and connecting roadways, and change in views across the valley floor due to the six-foot high embankments of the proposed Terminal Regulating Reservoir; in addition, future projects within the Extended and Secondary study areas would result in substantial and unavoidable effects to visual resources

ES.3.6 Responsibilities for Mitigation Monitoring Plan and Implementation

As part of proposed Project planning and environmental assessment, DWR, Reclamation and/or other partners would incorporate certain environmental commitments and best management practices into the action alternatives to avoid or minimize potential impacts. Reclamation would also coordinate planning, engineering, design and construction, operation, and maintenance phases of the proposed Project with applicable resource agencies. The following environmental commitments would be incorporated into any action alternative for any Project-related construction activities:

- Conduct DWR Environmental Site Assessment
- Develop and Implement Construction Management Plan
- Comply with Permit Terms and Conditions
- Develop and Implement Erosion and Sediment Control Plan
- Develop and Implement Stormwater Pollution Prevention Plan
- Develop and Implement Feasible Spill Prevention and Control Plan
- Implement Fisheries Conservation Measures
- Implement Water Quality Protection Measures
- Prepare and Implement Revegetation Plan
- Asphalt Removal

A detailed Mitigation Monitoring Plan is provided in Appendix 1A.

ES.4 Coordination with Concerned Agencies and Stakeholders

In accordance with NEPA and CEQA, DWR and Reclamation have conducted the following public scoping and agency coordination and consultation activities. Further information is provided in Chapter 36 Consultation and Coordination.

ES.4.1 Public Scoping

DWR and Reclamation notified interested parties of the scoping period and upcoming public scoping meetings through electronic and postal mailings and through publication of the NOP and NOI. Public notifications were also made through direct mailings to local landowners in and near the Sites and Newville reservoir alternative sites, and by advertisements in four local newspapers prior to the public meetings. In addition, a news release was placed on the DWR and Reclamation website homepages.

DWR and Reclamation conducted three scoping meetings (one meeting each in Sacramento, Maxwell, and Fresno, CA) to seek public input and comments prior to the preparation of the EIR/EIS. In addition, DWR and Reclamation held a scoping meeting with the Native American tribes in Williams, CA. At the scoping meetings and during the scoping comment period, the public was invited to submit written comments regarding the scope, content, and format of the environmental document by mail, fax, or email to representatives at DWR and Reclamation. A Scoping Report, which was prepared at the end of the scoping meetings and comment period, is included in Appendix 36A.

ES.4.2 Consultation

Since late 2001, DWR and Reclamation have met with the following stakeholders, interested parties, and State and federal regulatory agencies, including:

- Environmental Interests, County Boards of Supervisors, and Water Contractors
- Sacramento River Flow Regime Technical Advisory Group (TAG)
- California Bay-Delta Public Advisory Committee, Water Supply Subcommittee Briefings
- Common Assumptions Stakeholder Technical Workgroup
- Area Landowners
- Study Area Tours

ES.4.3 Coordination

Coordination efforts with local water interests, counties, and other State and federal agencies throughout the environmental documentation process included the following:

- Sites Memorandum of Understanding Partners
- Sites Project Joint Powers Authority
- Cooperating Agencies (Bureau of Indian Affairs, Western Area Power Administration, USACE, Colusa Indian Community Council, Cortina Indian Rancheria, and Sites Project JPA)
- Responsible Agencies (CDFW, State Water Resources Control Board, Central Valley Regional Water Quality Control Board - Central Valley Region 1, Tehama-Colusa Canal Authority, Glenn-Colusa Irrigation District, and Sites Project JPA)
- Trustee Agencies (CDFW, California State Lands Commission, California Department of Parks and Recreation, and University of California)
- Native American Representatives (Colusa Indian Community Council, Cortina Indian Rancheria, Grindstone Indian Rancheria, and Paskenta Band of Nomlaki Indians)
- Environmental Coordination Advisory Team (DWR, Reclamation, CDFW, USFWS, NMFS/NOAA Fisheries, CVRWQCB, USEPA, and USACE)

ES.5 Preliminary Administrative Draft EIR

The Preliminary Administrative Draft EIR has not been reviewed or approved for adequacy in meeting CEQA and NEPA requirements. The California Department of Water Resources (DWR) is releasing this document to provide decision-makers, stakeholders, and the public with up-to-date and detailed information on the investigation.

Release of this material does not constitute the initiation of formal public review of the Draft EIR as provided by CEQA Guidelines Section 15087. Although comments are welcome and may be considered in preparation of the Draft EIR, DWR will not respond to comments received on this document.

Please note the following reading guidance for this preliminary administrative draft. Refer to the summary Table of Contents for a list of chapters and appendixes. At this time, a detailed Table of Content, List of Abbreviations and Acronyms, Index, and Chapter 37, References, are not included. Abbreviations and acronyms are defined at first use in each chapter, and references are included in a

References section at the end of each chapter and appendixes when necessary. Some chapters/appendixes include figures and tables at the end of the chapters/appendixes.

In the future, a Public Draft EIR/EIS will be circulated for public and agency review and comment. The public review process and Proposed Project/Proposed Action approval process is discussed in Chapter 36 Consultation and Coordination.

ES.6 References

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Table

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
6. Surface Water Resources						
Impact Water Supply-1: A decrease in average annual CVP or SWP deliveries of greater than one percent with implementation of Alternatives A, B, and C, when compared to deliveries associated with the No Project/No Action Alternative						
Extended, Secondary and Primary Study Areas	N/A				None	N/A
CVP Contract Deliveries	N/A				None	N/A
Annual Long-Term Averages	N/A	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
Annual Dry and Critical Years Averages	N/A	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
SWP Contract Deliveries	N/A				None	N/A
Annual Long-Term Averages	N/A	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
Annual Dry and Critical Years Averages	N/A	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
7. Surface Water Quality						
Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality						
Extended Study Area						
Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use, San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Sacramento River, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento-San Joaquin Delta	No Substantial Adverse Effect / Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Suisun Bay, San Pablo Bay, San Francisco Bay	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1a: Implement a Water Quality Monitoring, Modeling, and Operations Coordination Program to Protect Beneficial Uses	Less than Significant
					SW Qual-1b: Excavate and remove, or consolidate and cap, Salt Lake	
					SW Qual-1c (1): Implement soil stabilization and sediment control BMPs	
					SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
					SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	
					SW Qual-1f: Implement BMPs including diversion ditches, berms, pipelines, sheet piles, and coffer dams	
					SW Qual-1g: Implement Caltrans Field Guide to Construction Site Dewatering	
					SW Qual-1h: Implement concrete waste management BMPs	
					SW Qual-1i: Implement vehicle and equipment cleaning procedures and practices	
					SW Qual-1j: Implement vehicle and equipment fueling procedures and practices	
					SW Qual-1k: Implement appropriate vehicle and equipment maintenance procedures and practices	
					SW Qual-1l: Implement appropriate pile driving procedures and practices	
Sites Reservoir Dams	N/A	Less than Significant / Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Recreation Areas	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1f and SW Qual-1h through SW Qual-1l	Less than Significant
Road Relocations and South Bridge	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Tunnel	N/A	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Sites Electrical Switchyard, Delevan Pipeline Electrical Switchyard	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Delevan Transmission Line	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	SW Qual-1c through SW Qual-1f and Mit SW Qual-1h through SW Qual-1l	Less than Significant
Field Office Maintenance Yard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Holthouse Reservoir Complex	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1a and SW Qual-1c through SW Qual-1l	Less than Significant
Holthouse Reservoir Electrical Switchyard	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
GCID Canal Facilities Modifications	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1c and SW Qual-1e	Less than Significant
TRR	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1a and SW Qual-1c through SW Qual-1l	Less than Significant
GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Pipeline, TRR Electrical Switchyard, TRR Pipeline Road	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline	N/A	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Delevan Pipeline Intake Facilities	N/A	Potentially Significant	N/A	Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Project Buffer	N/A	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	No Impact/ Less than Significant/ Potentially Significant	SW Qual-1c through SW Qual-1l	Less than Significant
Delevan Pipeline Discharge Facilities	N/A	N/A	Less than Significant/ Potentially Significant	N/A	SW Qual-1c through SW Qual-1l	Less than Significant
Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets						
Extended Study Area	N/A	N/A	N/A	N/A	None	N/A
Secondary Study Area					None	N/A
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, Keswick Reservoir, Clear Creek	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Shasta Lake	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento River	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Lake Oroville, Thermalito Complex, Feather River	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass, Yolo Bypass	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Folsom Lake, Lake Natoma	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento-San Joaquin Delta	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Suisun Bay, San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Reservoir Dams	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Recreation Areas	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Tunnel	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Sites Electrical Switchyard, Delevan Pipeline Electrical Switchyard, Delevan Transmission Line	N/A	No Impact	No Impact	No Impact	None	N/A
Field Office Maintenance Yard	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex	N/A	No Impact / Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Holthouse Reservoir Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
GCID Canal Facilities Modifications	N/A	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Pipeline, TRR Electrical Switchyard, TRR Pipeline Road	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Delevan Pipeline	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facilities	N/A	N/A	Less than Significant	N/A	None	N/A
8. Fluvial Geomorphology and Riparian Habitat						
Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics						
Extended Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Streamflow; Sediment concentration, turbidity or water clarity	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Red Bluff Pumping Plant	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Reduction of suspended sediment in spawning gravel, agricultural fields, navigable waters, and in weirs and bypasses	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	N/A				None	N/A
Delevan Pipeline Intake Facilities	N/A	No Impact/ Less than Significant	N/A	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity						
Extended Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Sand deposition on beaches	N/A	No Impact	No Impact	No Impact	None	N/A
Meander downstream of proposed Intake/Discharge Facilities	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento River bank erosion and meander rates	N/A	Beneficial	Less than Significant	Beneficial	None	N/A
Sediment deposition	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sediment deposition, woody debris, shaded riverine aquatic habitat, spawning gravel	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Geom-3: Substantial alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat						
Extended Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Most of Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Bedload movement, riparian recruitment, shaded riverine aquatic habitat, large woody debris, and spawning gravel	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
9. Flood Control						
Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	Significant/ Potentially Beneficial	Significant/ Potentially Beneficial	Significant/ Potentially Beneficial	Flood-1: Maintain Permanent Low Flow Releases into Stone Corral and Funks Creeks Downstream of Sites and Golden Gate Dams	Less than Significant
Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas, Road Relocations and South Bridge, GCID Canal Facilities Modifications, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road, Delevan Transmission Line, Delevan Pipeline Electrical Switchyard, Delevan Pipeline	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A					
Construction	N/A	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Operation	N/A	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge, GCID Canal Facilities Modifications, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road, Delevan Transmission Line, Delevan Pipeline Electrical Switchyard, Delevan Pipeline	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

	Level of Significance by Alternative				Recommended Mitigation	
Impact	**No Project/ No Action Alternative**	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Coordinated operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Recreation Areas, Road Relocations and South Bridge, GCID Canal Facilities Modifications, Delevan Transmission Line, Delevan Pipeline Electrical Switchyard, Delevan Pipeline	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
10. Groundwater Resources						
Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses						
Extended Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Secondary Study Area	Potentially Substantial Adverse Effect				None	N/A
Reservoir storage/flow regime changes	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas, Road Relocations and South Bridge, Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road, GCID Canal Facilities Modifications; Delevan Pipeline, Delevan Pipeline Electrical Switchyard, Delevan Transmission Line	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses						
Extended Study Area	No Impact	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Reservoir Storage/flow regime changes	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications, Delevan Pipeline, Delevan Pipeline Electrical Switchyard, Delevan Transmission Line, Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Holthouse Reservoir Complex	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Res-2: Monitor and Lower Groundwater Levels as Necessary	Less than Significant
					Bot-1d: Conduct Groundwater Hydrological Studies	Less than Significant or Potentially Significant and Unavoidable
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Res-2	Less than Significant
Delevan Pipeline Intake Facilities	N/A	Potentially Significant	N/A	Potentially Significant	GW Res-2	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
11. Groundwater Quality						
Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality						
Extended Study Area	Potentially Substantial Adverse Effect				None	N/A
Groundwater Use- Construction	N/A	No Impact	No Impact	No Impact	None	N/A
Agricultural, Municipal, and Industrial Water Use	N/A	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Level 4 Wildlife Refuge Water Use	N/A	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Groundwater Recharge	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Primary Study Area						
Groundwater Use	No Substantial Adverse Effect	N/A	N/A	N/A	None	N/A
Sites Reservoir Inundation Area	N/A				None	N/A
Groundwater Recharge	N/A	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems	Less than Significant

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Sites Reservoir Dams	N/A				None	N/A
Groundwater Recharge	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c: Implement Caltrans Field Guide to Construction Site Dewatering	Less than Significant
Recreation Areas	N/A				None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Septic System, Leach Field, and Vault Toilet Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1e: Construct Septic Systems, Leach Fields, and Vault Toilets in Accordance with County Permit Specifications	Less than Significant
Road Relocations and South Bridge	N/A				None	N/A
Hazardous Materials- Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Hazardous Materials- Operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c	Less than Significant
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard	N/A				None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c	Less than Significant
Septic System and Leach Field Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1e	Less than Significant
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard	N/A				None	N/A
Groundwater Recharge - construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Groundwater Recharge - operation	N/A	Beneficial	Beneficial	Beneficial	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c	Less than Significant
TRR, TRR Pipeline, TRR Pipeline Road, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and GCID Canal Connection to the TRR	N/A				None	N/A
Groundwater Recharge	N/A	Beneficial	Beneficial	Beneficial	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Abandoned Wells, Septic Systems, or Underground Storage Tanks	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c	Less than Significant
Underground Utilities	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1d: Identify Underground Utilities Prior to Start of Construction	Less than Significant
GCID Canal Facilities Modifications	N/A				None	N/A
Groundwater Recharge	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Delevan Transmission Line	N/A				None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant

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Summary of Environmental Effects by Resource

	Level of Significance by Alternative				Recommended Mitigation	
Impact	**No Project/ No Action Alternative**	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline, Delevan Pipeline Electrical Switchyard	N/A				None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Dewatering	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1c	Less than Significant
Underground Utilities	N/A	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1d	Less than Significant
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Groundwater Recharge	N/A	Potentially Beneficial	N/A	Potentially Beneficial	None	N/A
Hazardous Materials	N/A	Potentially Significant	N/A	Potentially Significant	SW Qual-1e	Less than Significant
Dewatering	N/A	Potentially Significant	N/A	Potentially Significant	GW Qual-1c	Less than Significant
Project Buffer	N/A				None	N/A
Groundwater Recharge	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Hazardous Materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Groundwater Recharge	N/A	N/A	Less than Significant	N/A	None	N/A
Hazardous Materials	N/A	N/A	Potentially Significant	N/A	SW Qual-1e	Less than Significant
Dewatering	N/A	N/A	Potentially Significant	N/A	GW Qual-1c	Less than Significant
12. Aquatic Biological Resources						
Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.						
Extended and Secondary Study Area						
Reservoir Coldwater Fish Species	No Substantial Adverse Effect	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial/ Potentially Significant	Fish-1a: Increase Stocking Frequency of Coldwater Fish Species	Less than Significant
Reservoir Warmwater Fish Species	No Substantial Adverse Effect	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	None	N/A
Southern Oregon/Northern California Coho Salmon; Upper Klamath-Trinity River Fall-Run and Spring-Run Chinook Salmon; Klamath Mountains Province Steelhead; Delta Smelt; Longfin Smelt	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento River Winter-Run Chinook Salmon						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c: Prepare and Implement a Stormwater Pollution Prevention Plan and an Erosion and Sediment Control Plan Prior to the Initiation of Construction Activities	Less than Significant
					Fish-1d: Prepare and Implement a Spill Prevention and Hazardous Materials Management Plan Prior to the Initiation of Construction Activities	Less than Significant
Operation	No Substantial Adverse Effect	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	None	N/A
Central Valley Spring-Run Chinook Salmon						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Operation	No Substantial Adverse Effect	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	Less than Significant/ Potentially Beneficial	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Central Valley Fall-Run Chinook Salmon						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
American River Operation	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
All Other Operation	No Substantial Adverse Effect	Less than Significant/ Potentially Beneficial Effect	Less than Significant/ Potentially Beneficial Effect	Less than Significant/ Potentially Beneficial Effect	None	N/A
Central Valley Late Fall-Run Chinook Salmon; Hardhead						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
White Sturgeon						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Yolo Bypass Operation	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1b: Prepare and Implement a Mitigation Monitoring and Reporting Plan	Less than Significant
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Central Valley Steelhead						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
American River Operation	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Yolo Bypass Operation	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1b	Less than Significant
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pacific Lamprey; River Lamprey						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
American River Operation	Potentially Substantial Adverse Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Striped Bass; American Shad						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
American River Operation	Potentially Substantial Adverse Effect	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sacramento-San Joaquin Roach						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Green Sturgeon; Sacramento Splittail						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
American River Operation	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Yolo Bypass Operation	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1b	Less than Significant
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Largemouth Bass						
Pump Installation at the Red Bluff Pumping Plant	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Yolo Bypass Operation	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1b	Less than Significant
All Other Operation	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Hydrostatic Pressure Waves, Noise and Vibration; Direct Harm	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Water Surface Elevation Fluctuations	N/A	No Impact	No Impact	No Impact	None	N/A
Aquatic Habitat Modification	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Fish-1e: Implement Habitat Restoration Actions	Less than Significant
Road Relocations and South Bridge	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Hydrostatic Pressure Waves, Noise and Vibration; Direct Harm; Aquatic Habitat Modification; Fish Passage	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Reservoir Inlet/Outlet Structure. Sites Pumping/Generating Plant	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Hydrostatic Pressure Waves, Noise and Vibration; Direct Harm; Fish Passage	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Aquatic Habitat Modification	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1e	Less than Significant
Holthouse Reservoir Complex	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and 1d	Less than Significant
Hydrostatic Pressure Waves, Noise and Vibration; Direct Harm; Fish Passage	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Aquatic Habitat Modification	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Fish-1e	Less than Significant
GCID Canal Facilities Modifications	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Potentially Significant	Potentially significant	Potentially significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially significant	Potentially significant	Fish-1c and Fish-1d	Less than Significant

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
TRR to Funks Creek Pipeline	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Direct Harm	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline	N/A				None	N/A
Erosion, Sedimentation and Turbidity	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Direct Harm; Fish Passage	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Aquatic Habitat Modification	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Fish-1e	Less than Significant
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Erosion, Sedimentation and Turbidity	N/A	Less than Significant/ Potentially Significant	N/A	Less than Significant/ Potentially Significant	Fish-1c	Less than Significant
Hazardous Materials and Chemical Spills	N/A	Potentially Significant	N/A	Potentially Significant	Fish-1c and Fish-1d	Less than Significant
Direct Harm; Fish Passage	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Hydrostatic Pressure Waves, Noise and Vibration	N/A	Less than Significant/ Potentially Significant	N/A	Less than Significant/ Potentially Significant	Fish-1f: Perform In-Water Pile Driving with a Vibratory Pile Driver July Through September During Daylight Hours.	Less than Significant
Predation Risk	N/A	Potentially Significant	N/A	Potentially Significant	Fish-1g: Design Fish Screen in Compliance with NMFS and CDFG Criteria	Less than Significant
Aquatic Habitat Modification	N/A	Less than Significant/ Potentially Significant	N/A	Less than Significant/ Potentially Significant	Fish-1e	Less than Significant
Stranding, Impingement and Entrainment	N/A	Less than Significant/ Potentially Significant	N/A	Less than Significant/ Potentially Significant	Fish-1h: Prepare and Implement a Fish Salvage and Rescue Plan	Less than Significant
Temperature Effects on the Sacramento River	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Hydrostatic Pressure Waves, Noise and Vibration	N/A	N/A	Less than Significant/ Potentially Significant	N/A	Fish-1f	Less than Significant
Predation Risk	N/A	N/A	Potentially Significant	N/A	Fish-1g	Less than Significant
Aquatic Habitat Modification	N/A	N/A	Less than Significant/ Potentially Significant	N/A	Fish-1e	Less than Significant
Temperature Effects on the Sacramento River	N/A	N/A	Less than Significant	N/A	None	N/A
13. Botanical Resources						
Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project.						
Extended Study Area						
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area					None	N/A
Trinity Lake, Shasta Lake, Lake Oroville; Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Trinity River, Klamath River downstream of Trinity River, Spring Creek, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Sacramento River, Sacramento-San Joaquin Delta, Suisun Bay,	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Clear Creek, San Pablo Bay, San Francisco Bay	Potentially Beneficial	No Impact	No Impact	No Impact	None	N/A
Feather River and American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass and Yolo Bypass	No Substantial Adverse Effect	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Primary Study Area	Potentially Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Annual Grassland Valley Edges; Salt Lake Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
Riparian Vegetation	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Bot-1a	Less than Significant
Valley Floor; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Blue Oak Woodland; Valley Oak Woodland	N/A	Significant	Significant	Significant	Bot-1a	Less than Significant
Recreation Areas	N/A					
Annual Grassland	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1a	Less than Significant
Blue Oak Woodland	N/A	Significant	Significant	Significant	Bot-1a	Less than Significant
					Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant
Chamise; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Annual Grassland	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1a	Less than Significant
Blue Oak Woodland; Riparian Vegetation	N/A	Significant	Significant	Significant	Bot-1a	Less than Significant
					Bot-1c	Less than Significant
Chamise; Mixed Chaparral; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Pumping/ Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard	N/A				None	N/A
Annual Grassland; Riparian Vegetation; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Holthouse Reservoir Complex	N/A				None	N/A
Annual Grassland	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1a	Less than Significant
					Bot-1b: Conduct Watershed Hydrological Studies	Less than Significant
Alkaline Wetland	N/A	Significant/ Potentially Significant	Significant/ Potentially Significant	Significant/ Potentially Significant	Bot-1a	Less than Significant or Potentially Significant and Unavoidable
					Bot-1d: Conduct Groundwater Hydrological Studies	Less than Significant or Potentially Significant and Unavoidable
					Bot-1e: Minimize Impacts by Siting Facilities Away from Drainage Swales and Implementing BMPs	Less than Significant or Potentially Significant and Unavoidable
Riparian Veg	N/A	Significant	Significant	Significant	Bot-1a	Less than Significant
Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Holthouse Reservoir Electrical Switchyard	N/A				None	N/A
Annual Grassland	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Alkaline Wetland	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Riparian Veg	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, TRR Pimping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline	N/A				None	N/A
Alkaline Wetland; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Freshwater Emergent Marsh	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1f: Implement BMPs to Avoid Disturbance of Marsh Vegetation in Adjacent Delevan National Wildlife Refuge	Less than Significant
TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard	N/A				None	N/A
Alkaline Wetland; Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Freshwater Emergent Marsh	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Transmission Line	N/A				None	N/A
Annual Grassland	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Riparian Veg	N/A	Significant Impact	Significant Impact	Significant Impact	Bot-1a	Less than Significant
					Bot-1c	Less than Significant
Other Land Cover	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake/Discharge Facilities	N/A				None	N/A
Riparian Scrub	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Fremont Cottonwood Forest	N/A	Significant	Significant	Significant	Bot-1a	Less than Significant
Other Land Cover	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Project Buffer	N/A				None	N/A
Annual Grassland, Blue Oak Woodland, Canal, Chamise, Ponds and Valley-Foothill Riparian	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1a	Less than Significant
					Bot-1b	Less than Significant
					Bot-1c	Less than Significant
Agriculture; Urban/Disturbed Land	N/A	Beneficial	Beneficial	Beneficial	None	N/A
Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS.						
Extended Study Area						
Wildlife Refuge Water Use, San Luis Reservoir	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area					None	N/A
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Trinity River, Klamath River downstream of Trinity River, Spring Creek, Clear Creek, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma; Thermalito Complex, San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Sacramento River, Feather River, Sacramento-San Joaquin Delta, Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass; Yolo Bypass	No Substantial Adverse Effect	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	Potentially Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
CNPS List 1B and State- or federally listed species	N/A	Significant	Significant	Significant	Bot-2a: Conduct Pre-Construction Surveys for Sidalcea keckii and Amsinckia lunaris; if Found, Compensate According to USFWS Guidelines	Significant and Unavoidable
CNPS List 4 species	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-2e: Compensate for Loss or Disturbance of CNPS List 4 Species According to CDFG Guidelines	Less than Significant or Potentially Significant and Unavoidable?
Recreation Areas	N/A				None	N/A
CNPS List 1B and State- or federally listed species	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	Bot-2a	Less than Significant
CNPS List 4 species	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
CNPS List 1B and State- or federally listed species	N/A	No Impact/ Significant	No Impact/ Significant	No Impact/ Significant	Bot-2a	Less than Significant
CNPS List 4 species	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	Bot-1c	Less than Significant
					Bot-2e	Less than Significant
Sites Pumping/ Generating Plant; Sites Electrical Switchyard; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; GCID Canal Facilities Modifications; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to TRR	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	Bot-1d:	Potentially Significant and Unavoidable
Holthouse Reservoir Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-2c: Conduct Pre-Construction Surveys for Rare Alkaline Wetland Species	Less than Significant
					Bot-2d: Conduct Pre-Construction Surveys for Special-Status Plant Species	Less than Significant
TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Transmission Line	N/A	No Impact/ Less than Significant/ Potentially Significant	Less than Significant	Same as Alt. B	Bot-2d	Less than Significant
					Bot-1c	Less than Significant
					Bot-2e	Less than Significant
Delevan Pipeline Intake/Discharge Facilities	N/A	No Impact	No Impact	No Impact	None	N/A
Project Buffer	N/A	Potentially Significant	Same as Alt. A	Same as Alt. A	Bot-2b	Less than Significant
Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species.						
Extended Study Area						
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Trinity River, Klamath downstream of Trinity River, Spring Creek, Lewiston Lake; Whiskeytwon Lake, Keswick Reservoir; Lake Natoma; Thermalito Complex, San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Sacramento River, Sacramento-San Joaquin Delta, Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Clear Creek	Potentially Beneficial	No Impact	No Impact	No Impact	None	N/A
Feather River; American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass; Yolo Bypass	No Substantial Adverse Effect	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A
Primary Study Area	Potentially Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams; Recreation Areas; Delevan Pipeline Intake/Discharge Facilities	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-3a: Implement Preventive Actions by Following Weed Control BMPs; Minimize Exposed Ground; Reduce Weed Seed by Removal of On-Site and Off-Site weeds	Less than Significant
Road Relocations and South Bridge	N/A	Significant	Significant	Significant	Bot-3a	Less than Significant
Sites Pumping/ Generating Plant; Sites Electrical Switchyard; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-3a	Less than Significant
Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-3a	Less than Significant
Delevan Transmission Line, Delevan Pipeline	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-3a	Less than Significant
					Bot-3b: Implement Avoidance Measures in Areas Adjacent to the Delevan National Wildlife Refuge	Less than Significant
GCID Canal Facilities Modifications; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR	N/A	No Impact	No Impact	No Impact	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance.						
Extended Study Area						
Wildlife Refuge Water Use, San Luis Reservoir	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams; Sites Pumping/ Generating Plant; Sites Electrical Switchyard; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Delevan Transmission Line; Delevan Pipeline Intake/Discharge Facilities	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas; Road Relocations and South Bridge; Holthouse Reservoir Complex Delevan Pipeline, Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Bot-1c	Less than Significant
					Bot-4: Implement Vegetation Monitoring in Coordination with USFWS	Less than Significant
GCID Canal Facilities Modifications; Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to TRR, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance.						
Extended Study Area						
Wildlife Refuge Water Use, San Luis Reservoir	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
14. Terrestrial Biological Resources						
Impact Wild-1: A substantial adverse effect, including alteration of habitat suitability, on any wildlife habitat, especially riparian habitat or other sensitive natural communities identified in local or regional plans, policies, regulations, or by DFG or USFWS.						
Extended Study Area						
Agricultural, Municipal, and Industrial Water Use; San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex; Klamath River downstream of the Trinity River, Spring Creek, Clear Creek, San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Trinity River, Sacramento River, Sutter Bypass, Yolo Bypass, Sacramento-San Joaquin Delta; Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Feather River; American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Annual Grassland, Blue Oak Woodland, Dryland Grain and Seed Crops, Pasture, Valley Foothill Riparian	N/A	Significant	Significant	Significant	Wild-1a: Implement a Combination of Habitat Protection, Enhancement, Restoration, or Conservation Easement Measures, in Consultation with USFWS	Less than Significant
Lacustrine	N/A	Potentially Beneficial/ Less than Significant	Potentially Beneficial/ Less than Significant	Potentially Beneficial/ Less than Significant	None	N/A
Urban/Disturbed	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1b: Implement Bat Exclusion Measures Prior to Demolition of Existing Structures	Less than Significant
Valley Oak Woodland Habitat	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1a	Less than Significant
Recreation Areas	N/A				None	N/A
Annual Grassland; Blue Oak Woodland	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Chamise-Redshank Chaparral; Lacustrine	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Annual Grassland; Blue Oak Woodland; Chamise-Redshank Chaparral; Dryland Grain and Seed Crops; Mixed Chaparral ; Valley Foothill Riparian	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Canal	N/A	No Impact	No Impact	No Impact	None	N/A
Lacustrine	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Urban/Disturbed	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1b	Less than Significant
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard	N/A				None	N/A
Annual Grassland; Valley Foothill Riparian	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Lacustrine	N/A	Less than Significant	Less than Significant	Less than Significant		
Urban/Disturbed	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1b	Less than Significant
Tunnel	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard	N/A				None	N/A
Annual Grassland; Dryland Grain and Seed Crops; Irrigated Row and Field Crops; Valley Foothill Riparian	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Fresh Emergent Wetland	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1a	Less than Significant
Canal; Lacustrine; Urban/Disturbed	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A				None	N/A
Canal; Urban/Disturbed	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR	N/A				None	N/A
Canal	N/A	No Impact	No Impact	No Impact	None	N/A
Urban/Disturbed, Deciduous Orchard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Dryland Grain and Seed Crops; Pasture; Rice	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A				None	N/A
Barren, Lacustrine	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1a	Less than Significant
Canal	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Deciduous Orchard; Dryland Grain and Seed Crops; Eucalyptus; Fresh Emergent Wetland; Irrigated Row and Field Crops; Pasture; Rice	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Urban/Disturbed	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Transmission Line	N/A				None	N/A
Annual Grassland; Dryland Grain and Seed Crops; Valley Foothill Riparian	N/A	Significant	Significant	Significant	Wild-1a	Less than Significant
Barren	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1a	Less than Significant
Canal	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Canal	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Deciduous Orchard; Valley Foothill Riparian	N/A	Significant	N/A	Significant	Wild-1a	Less than Significant
Riverine;	N/A	Potentially Significant	N/A	Potentially Significant	Wild-1a	Less than Significant
Urban/Disturbed	N/A	Potentially Significant	N/A	Potentially Significant	Wild-1b	Less than Significant
Project Buffer	N/A				None	N/A
Annual Grassland, Barren, Blue Oak Woodland, Canal, Chamise-Redshank Chaparral, Lacustrine, Valley Foothill Riparian; Deciduous Orchard, Dryland Grain and Seed Crops, Irrigated Row and Field Crops, Pasture, Rice;	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1a	Less than Significant
Urban/Disturbed	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1b	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Canal; Urban/Disturbed	N/A	N/A	Less than Significant	N/A	None	N/A
Deciduous Orchard; Valley Foothill Riparian	N/A	N/A	Significant	N/A	Wild-1a	Less than Significant
Riverine	N/A	N/A	Potentially Significant	N/A	Wild-1a	Less than Significant
Impact Wild-2: A substantial adverse effect, including mortality, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS.						
Extended Study Area						
Agricultural, Municipal, and Industrial Water Use, San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Klamath River downstream of the Trinity River, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Spring Creek, Clear Creek, Lake Natoma, Thermalito Complex, San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Trinity River; Sacramento River, Yolo Bypass, Sacramento-San Joaquin Delta, Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Feather River; American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass	No Substantial Adverse Effect	Potentially Beneficial	Potentially Beneficial	Potentially Beneficial	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Bald Eagle	N/A	Less than Significant/ Potentially Significant/ Significant	Less than Significant/ Significant Impact	Less than Significant/ Potentially Significant/ Significant	Wild-2a: Obtain Permit for Bald Eagle Nest Tree Removal, Remove Nest Tree Outside of Breeding Season, and Create Habitat.	Less than Significant
Golden Eagle	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wild-2d: Implement Avoidance and Minimization Measures at Historic or Active Golden Eagle Nest Sites. Conduct Satellite Telemetry Studies Pre- and Post-Construction to Determine Territory Size. Prepare a Golden Eagle Protection Plan and a Golden Eagle Monitoring Plan. Mitigate for Loss of Annual Grassland Foraging Habitat.	Significant and Unavoidable
Valley Elderberry Longhorn Beetle	N/A	Significant	Significant	Significant	Wild-2f: Implement Protective Actions to Avoid or Minimize Impacts to Elderberry Plants. Where Avoidance is not Possible, Transplant or Replace Plants, According to USFWS Guidelines.	Less than Significant
Western Burrowing Owl	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-2g: Conduct Preconstruction Surveys for Western Burrowing Owls. If Owls are Found, Implement Protective Actions.	Less than Significant
Western Pond Turtle	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wild 2h: Conduct Preconstruction Surveys and Provide a Biological Monitor During Construction for the Western Pond Turtle. If Found, Turtles shall be Captured and Relocated by a Qualified Biologist.	Less than Significant
Recreation Areas	N/A				None	N/A
Golden Eagle	N/A	Significant	Significant	Significant	Wild-2d	Significant and Unavoidable
Road Relocations and South Bridge	N/A				None	N/A
Valley Elderberry Longhorn Beetle	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wild-2f.	Less than Significant
Western Burrowing Owl	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-2g	Less than Significant
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard; Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generation Plant, TRR Electrical Switchyard, TRR Pipeline Road, GCID Canal Connection to the TRR, Delevan Pipeline Electrical Switchyard, Delevan Transmission Line	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Tunnel	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex	N/A				None	N/A
Water-Dependent Bird Species	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Western Pond Turtle	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wild-2h	Less than Significant
GCID Canal Facilities Modifications	N/A				None	N/A
Giant Garter Snake	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-2c: Conduct Preconstruction Surveys for Giant Garter Snakes and Implement Protective Actions. Conduct Construction Activity Between May 1 and October 1 in Giant Garter Snake Habitat. Compensate for Temporary Disturbance of Habitat According to USFWS Guidelines.	Less than Significant

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	Level of Significance by Alternative				Recommended Mitigation	
Impact	**No Project/ No Action Alternative**	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline, TRR Pipeline	N/A				None	N/A
Bank Swallow	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-2b: Implement Protective Actions to Prevent Bank Swallows from Nesting in the Cut Banks of Construction Trenches.	Less than Significant
Giant Garter Snake	N/A	Significant	Significant	Significant	Wild-2c	Less than Significant
Western Pond Turtle	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-2h	Less than Significant
Western Yellow-Billed Cuckoo	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Bank Swallow	N/A	No Impact	N/A	No Impact	None	N/A
Ringtail	N/A	Potentially Significant	N/A	Potentially Significant	Wild-2e: Implement Protective Actions to Minimize Impacts to the Ringtail, and Restore Connectivity of Riparian Corridor.	Less than Significant
Valley Elderberry Longhorn Beetle	N/A	Significant	N/A	Significant	Wild-2f	Less than Significant
Western Yellow-Billed Cuckoo	N/A	Less than Significant/ Potentially Significant	N/A	Less than Significant/ Potentially Significant	Wild-2i: Conduct Preconstruction Surveys for the Western Yellow-Billed Cuckoo and Schedule Construction Activities to Avoid Impacts to Nest Sites.	Less than Significant
Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-1b	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Bank Swallow	N/A	N/A	No Impact	N/A	None	N/A
Ringtail	N/A	N/A	Potentially Significant	N/A	Wild-2e	Less than Significant
Valley Elderberry Longhorn Beetle	N/A	N/A	Significant	N/A	Wild-2f	Less than Significant
Western Yellow-Billed Cuckoo	N/A	N/A	Less than Significant/ Potentially Significant	N/A	Wild-2i	Less than Significant
Impact Wild-3: Substantial interference with the movement of any native resident or migratory wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.						
Extended Study Area						
Agricultural, Municipal, and Industrial Water Use, San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Beneficial	Beneficial	Beneficial	None	N/A
Klamath River downstream of the Trinity River, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Spring Creek, Lake Natoma, Thermalito Complex; Clear Creek; San Pablo Bay, San Francisco Bay, Suisun Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Trinity River, Sacramento River; Sutter Bypass, Yolo Bypass, Sacramento-San Joaquin Delta	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Feather River, American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Resident Deer **Herd**	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Recreation Areas	N/A				None	N/A
Golden Eagle	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Small Mammals, Reptiles, and Amphibians	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Western Burrowing Owl	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Small Mammals, Reptiles, and Amphibians	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Tunnel	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex	N/A		Same as Alt. A	Same as Alt. A		
Small Mammals, Reptiles, and Amphibians	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Western Grebes	N/A	Less than Significant/ Beneficial	Less than Significant/ Beneficial	Less than Significant/ Beneficial	None	N/A
Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline, TRR Pipeline	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-3a: During Construction, Backfill Trenches within 72 hours of Pipeline Installation and Provide an Escape Ramp for Trapped Wildlife	Less than Significant
Delevan Transmission Line	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wild-3b: Construct Transmission Lines and Associated Equipment Following Suggested Practices for Avian Protection on Power Lines	Less than Significant
Delevan Pipeline Intake Facilities	N/A	Potentially Significant	N/A	Potentially Significant	Wild-3c: Restore Riparian Habitat Connectivity	Less than Significant
Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Discharge Facilities	N/A	N/A	Potentially Significant	N/A	Wild-3c	Less than Significant
Impact Wild-4: Indirect effects on common wildlife from human disturbance.						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake; Lake Oroville, Folsom Lake; Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex; Trinity River; Klamath River downstream of the Trinity River; Spring Creek; Sacramento River; Clear Creek; Feather River; Sutter Bypass; Yolo Bypass; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Wild-4: Implement Avoidance and Minimization Measures	Less than Significant
Impact Wild-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local or regional habitat conservation plan, or conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
15. Wetlands and Other Waters of the U.S.						
Impact Wet-1: A Permanent Change in the Use or Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means						
Extended Study Area						
Wildlife Refuge Water Use	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Thermalito Complex, Lake Natoma, Sacramento River, Spring Creek, Clear Creek, Sacramento-San Joaquin Delta, Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Trinity River and Klamath River Downstream of the Trinity River; Feather River; Sutter Bypass	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Yolo Bypass; American River	Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Canals	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-1b: Reroute Canals to Ensure Continued Hydrological Connection, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination	Less than Significant
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Streams	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wet-1a: Implement Compensatory Mitigation Measures for Streams pursuant to USACE Determination within the Watershed in which the Impacts Occur	Less than Significant
Ponds	N/A	No Impact	No Impact	No Impact	None	N/A
Recreation Areas	N/A				None	N/A
Streams	N/A	Potentially Significant/ Less than Significant	Less than Significant	Potentially Significant/ Less than Significant	Wet-1a	Less than Significant
Ponds	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Streams	N/A	Less than Significant/ Potentially Significant	Potentially Significant	Less than Significant/ Potentially Significant	Wet-1a	Less than Significant
Ponds	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Maintenance Office	N/A				None	N/A
Streams	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-1a	Less than Significant
Ponds	N/A	No Impact	No Impact	No Impact	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Holthouse Reservoir Complex	N/A				None	N/A
Streams	N/A	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	Wet-1a	Less than Significant
Ponds	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-1c: Restore Ponds to Original Condition, or Implement Other Compensatory Mitigation Measures pursuant to USACE Determination within the Same Hydrologic Unit in which the Ponds Occur	Less than Significant
Holthouse Reservoir Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR	N/A				None	N/A
Streams	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Transmission Line	N/A				None	N/A
Streams	N/A	No Impact/ Less than Significant	Less than Significant	No Impact/ Less than Significant	None	N/A
Ponds	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A				None	N/A
Streams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Ponds	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline	N/A				None	N/A
Streams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Ponds	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Wet-1c	Less than Significant
Delevan Pipeline Intake Facilities	N/A				None	N/A
Streams	N/A	No Impact/ Less than Significant/ Potentially Significant	N/A	No Impact/ Less than Significant/ Potentially Significant	Mit Wet-1a	Less than Significant
Project Buffer	N/A	No Impact/Less than Significant/ Potentially Significant	No Impact/Less than Significant/ Potentially Significant	No Impact/Less than Significant/ Potentially Significant	SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Delevan Pipeline Discharge Facilities	N/A	N/A		N/A	None	N/A
Streams	N/A	N/A	No Impact/ Less than Significant/ Potentially Significant	N/A	Wet-1a	Less than Significant
Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means						
Extended Study Area						
Wildlife Refuge Water Use, San Luis Reservoir	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity River, Klamath River Downstream of the Trinity River, Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Feather River; Thermalito Complex, Lake Natoma, Sacramento River; Spring Creek; Clear Creek; Sacramento-San Joaquin Delta, Suisun Bay	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sutter Bypass; Yolo Bypass; American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
San Pablo Bay, San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

	Level of Significance by Alternative				Recommended Mitigation	
Impact	**No Project/ No Action Alternative**	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams,	N/A				None	N/A
Seasonal Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2a: Conserve, Enhance, Restore, or Create Seasonal Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur	Less than Significant
Alkaline Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2b: Conserve, Enhance, Restore, or Create Alkaline Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur	Less than Significant
Vernal Pools	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2c: Conserve, Enhance, Restore, or Create Vernal Pools Equivalent to the Type of Vernal Pools Adversely Impacted, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination	Less than Significant
Emergent Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2d: Conserve, Enhance, Restore, or Create Emergent Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur	Less than Significant
Riparian Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2e: Conserve, Enhance, Restore, or Create Comparable Riparian Wetlands in the Inner Coast Range Foothills, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination	Less than Significant
Recreation Areas	N/A				None	N/A
Seasonal Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2a	Less than Significant
Road Relocations and South Bridge	N/A				None	N/A
Seasonal Wetlands	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Alkaline Wetlands	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Vernal Pools	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Emergent Wetlands	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex	N/A				None	N/A
Alkaline Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2b	Less than Significant
Seasonal Wetlands	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Wet-2a	Less than Significant
Delevan Transmission Line	N/A				None	N/A
Alkaline Wetlands; Vernal Pools	N/A	Less than Significant	No Impact	Less than Significant	None	N/A
Delevan Pipeline	N/A				None	N/A
Alkaline Wetlands	N/A	Less than Significant/ Potentially Significant/ No Impact	Less than Significant/ Potentially Significant/ No Impact	Less than Significant/ Potentially Significant/ No Impact	Wet-2b	Less than Significant
Vernal Pools	N/A	Potentially Significant/ No Impact	Potentially Significant/ No Impact	Potentially Significant/ No Impact	Wet-2c	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline Intake Facilities	N/A				None	N/A
Riparian Wetlands	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	SW Qual-1c(1)	Less than Significant
Delevan Pipeline Discharge Facilities	N/A	N/A	Less than Significant	N/A	None	N/A
16. Geology, Minerals, Soils, and Paleontology						
Geology and Soils						
Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance						
Extended, Secondary and Primary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A	Potentially Significant/ No Impact	Potentially Significant	Potentially Significant	Geo/Soils-2: Implement a Project Erosion and Sediment Control Plan, and Stormwater Pollution Prevention Plan, during Project Construction, Operation, and Maintenance	Less than Significant
Sites Reservoir Dams	N/A	Potentially Significant/ Less than Significant	Potentially Significant	Potentially Significant	Geo/Soils-2	Less than Significant
Recreation Areas	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Geo/Soils-2	Less than Significant
Road Relocations and South Bridge	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Geo/Soils-2	Less than Significant
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, GCID Canal Facilities Modifications, Delevan Transmission Line	N/A	Potentially Significant/ Less than Significant	Potentially Significant/ Less than Significant	Potentially Significant/ Less than Significant	Geo/Soils-2	Less than Significant
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Geo/Soils-2	Less than Significant
Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Potentially Significant/ No Impact	N/A	Potentially Significant/ No Impact	Geo/Soils-2	Less than Significant
Delevan Pipeline Discharge Facilities	N/A	N/A	Potentially Significant	N/A	None	N/A
Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Dams	N/A	No Impact	No Impact	No Impact	None	N/A
Recreation Areas, Road Relocations and South Bridge, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, GCID Canal Facilities Modifications, Delevan Transmission Line; Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Geo/Soils-3: Perform a Geotechnical Investigation due to Expansive Soils at Project Facility Sites	Less than Significant
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facilities	N/A	N/A	Less than Significant	N/A	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams; Recreation Areas; Road Relocations and South Bridge; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, GCID Canal Facilities Modifications, Delevan Transmission Line; Delevan Pipeline TRR Pipeline; TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities, Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Field Office Maintenance Yard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Geo/Soils-4: Implement Avoidance Measures for Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal	Less than Significant
Minerals						
Impact Min-1: Loss of Availability of a Known Mineral Resource that would be of Value to the Region and the Residents of the State						
Extended and Secondary Study Areas	No Substantial Adverse Effect				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Min-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant/ No Impact			None	N/A
Primary Study Area	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Min-3: Expose People to Naturally Occurring Asbestos during Project Construction, Operation, or Maintenance						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Paleontology						
Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources						
Extended and Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

Table ES-3
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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Site Reservoir Inundation Area; Sites Reservoir Dams; Recreation Areas; Road Relocations and South Bridge; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications; GCID Canal Connection to the TRR; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline; TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Transmission Line; Delevan Pipeline	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Paleo-1a: Retain a Qualified Paleontological Resource Specialist Prior to the Start of Construction	Less than Significant
					Paleo-1b: Consultation with the Paleontological Resource Specialist Prior to and During Project Construction	
					Paleo-1c: Prepare and Implement a Paleontological Resources Monitoring and Mitigation Plan	
					Paleo-1d: Conduct Paleontological Resources Awareness Training	
					Paleo-1e: Conduct Monitoring During Project Construction and Prepare Monthly Reports	
					Paleo-1f: Ensure Implementation of the Paleontological Resources Monitoring and Mitigation Plan	
Delevan Pipeline Intake Facilities	N/A	Potentially Significant	N/A	Potentially Significant	Paleo-1a through Paleo-1f	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A	Potentially Significant	N/A	Paleo-1a through Paleo-1f	Less than Significant
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
17. Faults and Seismicity						
Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Seis-1: Implement Slope Stabilization Methods; Design Facilities to Withstand Fault Rupture, Seismic Ground Shaking, Ground Failure, and Liquefaction	Less than Significant
Impact Seis-2: Inundation by Seiches or Tsunamis						
Extended, Secondary, and Primary Study Areas	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Impact Seis-3: Reservoir-Induced Seismicity						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
18. Cultural Resources						
Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5						
Extended Study Area						
Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant		
San Luis Reservoir	No Substantial Adverse Effect	Potentially Significant/No Impact	Potentially Significant/No Impact	Potentially Significant/No Impact	Cul-1e: Develop Agreement Documents to Address Potential Future Operational Impacts to Cultural Resources	Less than Significant or Significant and Unavoidable
Secondary Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a: Avoid Impacts to Historical Resources/Historic Properties	No Impact
					Cul-1b: Conduct Archaeological Data Recovery	Less than Significant
					Cul-1c: Immediately Halt Construction if Cultural Resources are Discovered and Implement an Accidental Discovery Plan	Less than Significant
					Cul-1d: Protection of Archaeological Sites by Capping	Less than Significant
Recreation Areas	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Road Relocations and South Bridge- construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Road Relocations and South Bridge- operations	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Maintenance Office	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex, Holthouse Electrical Switchyard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
GCID Canal Facilities Modifications	N/A		Same as Alt. A	Same as Alt. A	None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a through Cul-1d	No Impact/ Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A	Potentially Significant	N/A	Cul-1a through Cul-1d	No Impact/ Less than Significant
Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a	No Impact
					Cul-2a: Follow the Secretary of the Interior's Standards for the Treatment of Historical Resources/Historic Properties	Less than Significant
					Cul-2b: Record Built Environment Resources to Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) Standards	Significant and Unavoidable if eligible for CRHR or NRHP listing
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Recreation Areas	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A	No Impact	No Impact	No Impact	None	N/A
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Maintenance Office	N/A	No Impact	No Impact	No Impact	None	N/A
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
GCID Canal Facilities Modifications	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a, Cul-2a and Cul-2b	No Impact/ Less than Significant/ Significant and Unavoidable if eligible for CRHR or NRHP listing
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a, Cul-2a and Cul-2b	No Impact/ Less than Significant/ Significant and Unavoidable if eligible for CRHR or NRHP listing
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Project Buffer - construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a, Cul-2a and Cul-2b	No Impact/ Less than Significant/ Significant and Unavoidable if eligible for CRHR or NRHP listing
Proposed Buffer - operations	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Potentially Significant	N/A	Cul-1a, Cul-2a and Cul-2b	No Impact/ Less than Significant/ Significant and Unavoidable if eligible for CRHR or NRHP listing

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Cul-3: Disturb a Traditional Cultural Property						
Extended Study Area						
Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1e	Less than Significant or Significant and Unavoidable
San Luis Reservoir	No Substantial Adverse Effect	No Impact/ Potentially Significant	No Impact/ Potentially Significant	No Impact/ Potentially Significant	Cul-1e	Less than Significant or Significant and Unavoidable
Secondary Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams; Road Relocations and South Bridge	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a	No Impact
					Cul-3: Consult with Native American Communities regarding How to Mitigate for Impacts to TCPs	Less than Significant or Significant and Unavoidable for some categories of TCPs
Recreation Areas; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Maintenance Office; Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard; Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a and Cul-3	No Impact/ Less than Significant or Significant and Unavoidable for some categories of TCPs
GCID Canal Facilities Modifications	N/A	No Impact	No Impact	No Impact	None	N/A
TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a and Cul-3	No Impact Less than Significant or Significant and Unavoidable for some categories of TCPs
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Potentially Significant	N/A	Cul-1a and Cul-3	No Impact/ Less than Significant or Significant and Unavoidable for some categories of TCPs
Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries						
Extended Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1e	Less than Significant or Significant and Unavoidable
Secondary Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams; Road Relocations and South Bridge; Project Buffer	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a	No Impact
					Cul-4a: Relocation of Known Cemeteries	Less than Significant
					Cul-4b: Immediately Halt Construction if Human Remains are Discovered and Implement a Burial Treatment Plan	Less than Significant
Recreation Areas; Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a and Cul-4a through Cul-4b	No Impact/ Less than Significant
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Maintenance Office	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a and Cul-4a through Cul-4b	No Impact/ Less than Significant
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
GCID Canal Facilities Modifications, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Cul-1a and Cul-4a through Cul-4b	No Impact/ Less than Significant
Operations	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Potentially Significant	Same as Alt. A	Cul-1a and Cul-4a through Cul-4b	No Impact/ Less than Significant
19. Indian Trust Assets						
Extended, Secondary and Primary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None required	N/A
20. Land Use						
Impact Land-1: Physical Division of an Established Community						
Extended Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams South Bridge	N/A	Significant Impact	Significant Impact	Significant Impact	No Feasible Mitigation	Significant and Unavoidable
Recreation Areas; Road Relocations; TRR Pipeline Road; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Electrical Switchyard; Delevan Pipeline Electrical Switchyard; GCID Canal Facilities Modifications; GCID Canal Connection to the TRR; TRR; TRR Pumping/Generating Plant; TRR Electrical Switchyard; Delevan Pipeline; TRR Pipeline; Delevan Transmission Line; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility, Electrical Distribution Lines, Project Buffer	N/A	N/A	N/A	N/A	None	N/A
Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect					
Glenn County portion of Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Road Relocations, Project Buffer	N/A	Significant Impact	Significant Impact	Significant Impact	Land-2a: To the Extent Possible, Work with Glenn County to Encourage the County to Modify or Amend the Glenn County General Plan to Bring it into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Colusa County portion of Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Road Relocations, Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline, Delevan Transmission Line (construction)	N/A	Significant Impact	Significant Impact	Significant Impact	Land-2b: Execute an Agreement with NRCS to Amend WRP Easement Contract and Conduct Post-Construction Wetland Restoration	Less than Significant
South Bridge, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Electrical Switchyard; Delevan Pipeline Electrical Switchyard; GCID Canal Connection to the TRR; TRR; TRR Pumping/Generating Plant; TRR Electrical Switchyard; TRR Pipeline; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility, Electrical Distribution Lines	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
GCID Canal Facilities Modifications, Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline, TRR Pipeline, Delevan Transmission Line, Electrical Distribution Lines	N/A	No Impact/ Significant	No Impact/ Significant	No Impact/ Significant	Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant
Sites Reservoir Inundation Area, Sites Reservoir Dams	N/A	No Impact/ Significant	No Impact/ Significant	No Impact/ Significant	Cul-4a	Less than Significant
					Land-3a	Less than Significant or Significant and Unavoidable
Recreation Areas; Road Relocations and South Bridge, TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; TRR; TRR Pumping/Generating Plant; GCID Canal Connection to the TRR; TRR Electrical Switchyard	N/A	No Impact/ Significant	No Impact/ Significant	No Impact/ Significant	Land-3a	Less than Significant or Significant and Unavoidable
Delevan Pipeline Intake Facilities	N/A	No Impact/ Significant	N/A	No Impact/ Significant	Land-3a	Less than Significant
					Land-3b: Execute an Agreement with Maxwell Irrigation District to Minimize and Avoid Short-Term and Long-Term Impacts to Existing Facilities and Operations	
Delevan Pipeline Discharge Facility	N/A	N/A	No Impact/ Significant	N/A	Land-3a and Land-3b	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use						
Extended Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Colusa County portions of Road Relocations, TRR Pipeline Road, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard, TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR Electrical Switchyard	N/A	Significant	Significant	Significant	Land-4a: Enter into Agricultural Conservation Easements with Glenn and Colusa Counties	Less than Significant
Delevan Pipeline Intake Faculties	N/A	Significant	N/A	Significant	Land-4a	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A	Significant	N/A	Land-4a	Less than Significant
Glenn County portions of Road Relocations	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Transmission Line, Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams; Road Relocations and South Bridge; Recreation Areas; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; GCID Canal Facilities Modifications; Delevan Pipeline; TRR Pipeline; Electrical Distribution Lines	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams; Road Relocations and South Bridge; Recreation Areas; TRR Pipeline Road; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard, Project Buffer	N/A				None	N/A
Zoning	N/A	Significant	Significant	Significant	Land-5a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Zoning Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Williamson Contract	N/A	Significant	Significant	Significant	Land-5b: Acquire Lands Through Eminent Domain	Less than Significant
					Land-5c: For Land Permanently Acquired other than by Eminent Domain, Seek County Approvals to Rescind Williamson Act Contracts and Enter in Open Space Contracts or Open Space Easements	Less than Significant or Significant and Unavoidable
Delevan Transmission Line, Delevan Pipeline	N/A				None	N/A
Zoning	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Williamson Contract	N/A	Significant	Significant	Significant	Land-5b	Less than Significant
					Land-5c	Less than Significant or Significant and Unavoidable

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
GCID Canal Facilities Modifications, Delevan Pipeline, TRR Pipeline	N/A	No Impact	No Impact	No Impact	None	N/A
GCID Canal Connection to the TRR, TRR; TRR Pumping/Generating Plant, TRR Electrical Switchyard	N/A				None	N/A
Zoning	N/A	Significant	Significant	Significant	Land-5a	Less than Significant or Significant and Unavoidable
Williamson Contract	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Transmission Line; Electrical Distribution Lines	N/A				None	N/A
Zoning	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Williamson Contract	N/A	Significant	Significant	Significant		
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Zoning	N/A	Significant	N/A	Significant	Land-5a	Less than Significant or Significant and Unavoidable
Williamson Contract	N/A	No Impact	N/A	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Zoning	N/A	N/A	Significant	N/A	Land-5a	Less than Significant or Significant and Unavoidable
Williamson Contract	N/A	N/A	No Impact	N/A	None	N/A
Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams; Road Relocations and South Bridge; Recreation Areas; TRR Pipeline Road; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir; Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; Delevan Transmission Line; Project Buffer	N/A	Significant	Significant	Significant	Land-5a	Less than Significant or Significant and Unavoidable
GCID Canal Facilities Modifications, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant; TRR Electrical Switchyard; Delevan Pipeline; TRR Pipeline	N/A	No Impact	No Impact	No Impact	None	N/A
Electrical Distribution Lines	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	No Impact	N/A	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	No Impact	N/A	None	N/A
Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect				None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A

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Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area; Sites Reservoir Dams; South Bridge; Recreation Areas; Project Buffer	N/A	Significant	Significant	Significant	Land-3a	Less than Significant or Significant and Unavoidable
Road Relocations; TRR Pipeline Road; Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Facilities Modifications, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant; TRR Electrical Switchyard, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, Electrical Distribution Lines	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A	No Impact	N/A	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	No Impact	N/A	None	N/A
Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area ; Sites Reservoir Dams; Project Buffer	N/A	Significant	Significant	Significant	Land-3a	Less than Significant or Significant and Unavoidable
					Land-4a	Less than Significant
Road Relocations and South Bridge; Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard; GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant; TRR Electrical Switchyard; Delevan Transmission Line	N/A	Significant	Significant	Significant	Land-4a	Less than Significant
Delevan Pipeline, TRR Pipeline, Electrical Distribution Lines	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A	Significant	N/A	Significant	Land-4a	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A	Significant	N/A	Land-4a	Less than Significant
21. Recreation Resources						
Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated						
Extended Study Area						
Wildlife Refuge Water Use, San Luis Reservoir, Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Trinity River, Klamath River downstream of the Trinity River, Shasta Lake, Sacramento River, Pump Installation at the Red Bluff Pumping Plant, Clear Creek, Lake Oroville, Feather River, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Sutter Bypass, Yolo Bypass	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
All Primary Study Area Project Facilities with the exception of the Delevan Pipeline Intake/Discharge Facilities	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Effect on the Environment						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
All Primary Study Area Project Facilities	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Rec-3: Reduce Recreation Use Levels at Existing Nearby Recreation Facilities by Providing an Alternative New Site for Recreation Visitors						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Trinity River, Klamath River downstream of the Trinity River, Shasta Lake, Sacramento River, Pump Installation at the Red Bluff Pumping Plant, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Lake Oroville, Folsom Lake	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
All Primary Study Area Project Facilities	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Rec-4: Affect Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria						
Extended Study Area						
San Luis Reservoir	Beneficial Effect/No Substantial Adverse Effect	Beneficial Effect/ Potentially Significant	No Impact/ Beneficial Effect/ Potentially Significant	Less than Significant/Beneficial Effect/ Potentially Significant	Rec-4a: Extend the Existing Dinosaur Point Boat Ramp at San Luis Reservoir (Alternative C only)	Less than Significant
					Rec-4b: Extend the Basalt Campground Water Intake at San Luis Reservoir	Less than Significant
Other Reservoirs	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake	Beneficial Effect/ No Substantial Adverse Effect	Beneficial Effect	Beneficial Effect	Beneficial Effect	None	N/A
Klamath River downstream of the Trinity River, Clear Creek, Sacramento-San Joaquin Delta; Suisun Bay, San Pablo Bay, San Francisco Bay, Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Trinity River; Feather River; Sacramento River, Sutter Bypass, Yolo Bypass	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Shasta Lake	No Substantial Adverse Effect/Potentially Substantial Adverse Effect/Beneficial Effect	Beneficial Effect	Beneficial Effect	Beneficial Effect	None	N/A
Lake Oroville	Potentially Substantial Adverse Effect/ Beneficial Effect	No Impact/ Beneficial Effect	No Impact/ Beneficial Effect	No Impact/ Beneficial Effect	None required	N/A
Folsom Lake	Potentially Substantial Adverse Effect	Beneficial Effect/ Potentially Beneficial Effect	Beneficial Effect	Beneficial Effect	None	N/A
American River	Potentially Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None required	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	N/A	N/A	N/A	None	N/A
Impact Rec-5: Reduce Recreation Use Levels at Existing Recreation Facilities During the Period of Construction						
Extended Study Area	N/A	N/A	N/A	N/A	None	N/A
Secondary Study Area						
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	N/A				None	N/A
Sites Reservoir Inundation Areas, Sites Reservoir Dams; Recreation Areas, Road Relocations and South Bridge; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications; GCID Canal Connection to the TRR; TRR; TRR Pumping/Generating Plant; TRR Electrical Switchyard, TRR Pipeline; TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Transmission Line	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A	Less than Significant	N/A	None	N/A
22. Socioeconomics						
Impact Socio-1: Effects on Regional Economics						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Socio-2: Effects on Population and Housing						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Socio-3: Effects on Local Government Fiscal Conditions						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Socio-4: Effects on Recreation Economics						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Socio-5: Effects on Agricultural Economics						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Socio-6: Effects on M&I Water Use Economics						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
23. Environmental Justice						
Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area						
Minority, Low-Income, and Hispanic Populations	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Job and Recreational Opportunities	No Substantial Adverse Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	Potentially Beneficial Effect	None	N/A
24. Air Quality						
Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction Impacts	N/A	Significant	Significant	Significant	Air Qual-1a: Develop a Fugitive Dust Control Plan.	Significant and Unavoidable for Emissions of PM_{10}
					Air Qual-1b: Implement Measures to Reduce Equipment and Vehicle Exhaust Emissions.	Significant and Unavoidable for Emissions of NO_x, PM_{10}, and ROG
						Less than Significant for Emissions of SO_x, CO, and $PM_{2.5}$
Operation and Maintenance Impacts	N/A	Significant	Significant	Significant	Air Qual-1a	Less than Significant
					Air Qual-1b	Less than Significant
Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People						
Extended and Secondary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
25. Climate Change and Greenhouse Gas Emissions						
Impact GHG-1: Generation of Cumulative GHG Emissions						
Extended, Secondary, and Primary Study Areas						
Construction, Operation, and Maintenance of the Proposed Project	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation of Existing SWP Facilities	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
CVP Operational Emissions	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	No Feasible Mitigation	Potentially Significant and Unavoidable
Open Water Surfaces and Tailraces	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
26. Navigation, Transportation, and Traffic						
Navigation						
Impact Nav-1: Conflict with Navigation Along any of the Navigable Waterways within the Primary, Secondary, or Extended Study Areas						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction of Delevan Pipeline Intake/ Discharge Facilities	N/A	Less than Significant	Less than Significant	Less than Significant	None required	N/A
Transportation and Traffic						
Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant/ Significant	Less than Significant/ Significant	Less than Significant/ Significant	Trans-1: Prepare and Implement a Project Operation Traffic Control Plan	Less than Significant
Impact Trans-2: Conflict with an Applicable Congestion Management Program, Including, but not Limited to, Level of Service Standards and Travel Demand Measures, or Other Standards Established by the County Congestion Management Agency for Designated Roads or Highways						
Extended, Secondary and Primary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Impact Trans-3: Substantially Increase Hazards Due to a Design Feature or Incompatible Uses						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Trans-3: Prepare and Implement a Project Construction Traffic Control Plan	Less than Significant
Operation and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Trans-4: Result in Inadequate Emergency Access						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

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Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Impact Trans-5: Conflict with Adopted Policies, Plans, or Programs Regarding Public Transit, Bicycle, or Pedestrian Facilities, or Otherwise Decrease the Performance or Safety of Such Facilities						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction and Operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
27. Noise						
Impact Noise-1: Expose persons to or generation of noise levels in excess of established standards						
Extended Study Area	No Substantial Adverse Effect	No Impact	Same as Alt. A	Same as Alt. A	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact	Same as Alt. A	Same as Alt. A	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
Operation and Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a	Less than Significant
Operation	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-1b: Design Facilities to Incorporate Noise Mitigation	Less than Significant
Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline, Delevan Transmission Line	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a	Less than Significant
Operation and Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A		N/A			
Construction	N/A	Significant Impact	N/A	Significant Impact	Noise-1a	Less than Significant
Operation and Maintenance	N/A	Potentially Significant	N/A	Potentially Significant	Noise-1b	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Construction	N/A	N/A	Significant Impact	N/A	Noise-1a	Less than Significant
Operation and Maintenance	N/A	N/A	Potentially Significant	N/A	Noise-1b	Less than Significant
Project Buffer	N/A				None	N/A
Construction and Maintenance	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-1a	Less than Significant
Operation	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-1b	Less than Significant
Impact Noise-2: Expose persons to or generation of excessive ground borne vibration or ground borne noise levels						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Ba	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
GCID Canal Facilities Modifications	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-2: Develop and Implement a Vibration Monitoring Plan	Less than Significant
Operation and Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-2	Less than Significant
Operation and Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline, Delevan Transmission Line	N/A				None required	N/A
Construction- Pipeline	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-2	Less than Significant
Construction- Transmission	N/A	No Impact	No Impact	No Impact	None	N/A
Operation and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake Facilities	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Construction	N/A	N/A	Less than Significant	N/A	None	N/A
Operation and Maintenance	N/A	N/A	No Impact	N/A	None	N/A
Project Buffer	N/A	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Noise-3: Result in a substantial permanent increase in ambient noise levels in the Project vicinity						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Ba	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Construction and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A				None	N/A
Construction	N/A	No Impact	No Impact	No Impact	None	N/A
Operation and Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road	N/A				None	N/A
Construction	N/A	No Impact	No Impact	No Impact	None	N/A
Operation and Maintenance	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-1a and Noise-1b	Less than Significant
Delevan Pipeline, Delevan Transmission Line	N/A				None	N/A
Construction	N/A	No Impact	No Impact	No Impact	None	N/A
Operation and Maintenance	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Construction and Maintenance	N/A	No Impact	N/A	No Impact	None	N/A
Operation	N/A	Potentially Significant	N/A	Potentially Significant	Noise-1b	Less than Significant
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Construction and Maintenance	N/A	N/A	No Impact	N/A	None	N/A
Operation	N/A	N/A	Potentially Significant	N/A	Noise-1b	Less than Significant
Project Buffer	N/A				None	N/A
Construction and Maintenance	N/A	No Impact	No Impact	No Impact	None	N/A
Operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Noise-4: Result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Delevan Pipeline Electrical Switchyard	N/A	No Impact	No Impact	No Impact	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a	Less than Significant
Operation	N/A	No Impact	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Maintenance		Less than Significant	Less than Significant	Less than Significant	None	N/A
GCID Canal Facilities Modifications	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Noise-1a	Less than Significant
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a	Less than Significant
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline, Delevan Transmission Line	N/A				None	N/A
Construction	N/A	Significant Impact	Significant Impact	Significant Impact	Noise-1a	Less than Significant
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Maintenance	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake Facilities	N/A		N/A		None	N/A
Construction and Maintenance	N/A	Less than Significant	N/A	Less than Significant	None	N/A
Operation	N/A	No Impact	N/A	No Impact	None	N/A
Delevan Pipeline Discharge Facility	N/A	N/A		N/A	None	N/A
Construction and Maintenance	N/A	N/A	Less than Significant	N/A	None	N/A
Operation	N/A	N/A	No Impact/ Less than Significant	N/A	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Project Buffer	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	No Impact	No Impact	No Impact	None	N/A
Maintenance	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Noise-1a	Less than Significant
Impact Noise-5: Expose people residing or working in the Project area to excessive noise levels (when the Project is located within an airport land use plan or within two miles of a public airport).						
Extended and Secondary Study Areas	N/A	N/A	N/A	N/A	None	N/A
Primary Study Area						
GCID Canal Facilities Modifications	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
28. Public Health and Environmental Hazards						
Hazardous Materials						
Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials						
Extended Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect					
Sediment removal; Release of hazardous materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Soil/Sediment contamination	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment						
Extended Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect					
Sediment removal; Release of hazardous materials	N/A	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	Less than Significant
Soil/Sediment contamination	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	SW Qual-1e	
Impact Pub Health-3: Effects from Hazardous Emissions or Hazardous Materials, Substances, or Wastes within 0.25 Mile of an Existing or Proposed School						
Extended Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Secondary and Primary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems-	Less than Significant
					Pub Health-4: Dispose of Hazardous Waste Discovered during Project Construction Pursuant to CERCLA Requirements	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

	Level of Significance by Alternative				Recommended Mitigation	
Impact	**No Project/ No Action Alternative**	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction- Oversized Vehicles	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Trans-3: Prepare and Implement a Project Construction Traffic Control Plan	Less than Significant
Operation- Increased Traffic	N/A	Significant	Significant	Significant	Trans-1: Prepare and Implement a Project Operation Traffic Control Plan	Less than Significant
Operation – Increased Recreation Visitors	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Trans-1	Less than Significant
Project-Related Operation and Maintenance Traffic	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires						
Extended and Secondary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Potentially Significant	Potentially Significant	Potentially Significant	Pub Health-6: Develop and Implement a Project Fire Prevention and Suppression Plan and Consult with Fire Protection Agencies	Less than Significant
Impact Pub Health-7: Create a Safety Hazard for People Residing or Working in the Project Area (if Located within an Airport Land Use Plan or within Two Miles of a Public Airport or Public Use Airport if no Plan has been Adopted)						
Extended and Secondary Study Areas	N/A	N/A	N/A	N/A	None	N/A
Primary Study Area	N/A	No Impact	No Impact	No Impact	None	N/A
Mosquitoes and Other Vectors						
Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems						
Extended Study Area	No Substantial Adverse Effect				None	N/A
Agricultural, Municipal, and Industrial Water Use	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Wildlife Refuge Water Use	N/A	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Ponding during Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Pub Health-9a: Develop and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Sites Reservoir Inundation Area, Recreation Areas, Holthouse Reservoir, TRR, Delevan Pipeline Intake Facilities (operation and maintenance)	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Pub Health-9b: Develop and Implement a Mosquito, Vector, and other Nuisance Problems Control Plan	Less than Significant
29. Public Services and Utilities						
Impact Services-1: A substantial adverse physical impact associated with the provision of new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for the following public services: fire protection, police protection, schools, parks, and/or other public facilities, and disruptions to local or regional utility services						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Construction Impacts						
Emergency service providers	N/A	No Impact	No Impact	No Impact/ Less than Significant/ Potentially Significant/ Significant	None	N/A
School bus service	N/A	No Impact	No Impact	No Impact	None	N/A
Disruption of existing utility services – All Primary Study Area Project Facilities except Holthouse Reservoir	N/A	No Impact/ Less than Significant/ Significant	No Impact/ Less than Significant/ Significant	No Impact/ Less than Significant/ Significant	Services-1a: Avoid Damage to or Disruption of Existing Utility Services	Less than Significant
Disruption of existing utility services – Holthouse Reservoir	N/A	Significant	Significant	Significant	Services-1b: Perform Utility Relocation or Modification	Less than Significant
Operations Impacts	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Impact Services-2: A decline in property tax or fee revenues that would lead to a substantial decrease in public services						
Extended Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	Less than Significant/ No Impact	Less than Significant/ No Impact	Less than Significant/ No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Services-3: Exceed the wastewater treatment requirements of the applicable Regional Water Quality Control Board						
Extended, Secondary and Primary Study Areas	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Impact Services-4: The need for expansion of existing wastewater treatment, water treatment, stormwater, and/or landfill facilities						
Extended Study Area	No Substantial Adverse Effect	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
Secondary Study Area						-
Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex; Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Impact Services-5: Require new or expanded water supply entitlements and resources						
Extended Study Area	No Substantial Adverse Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Impact Services-6: Non-compliance with federal, State, and local statutes and regulations related to solid waste						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
30. Visual Resources						
Impact Vis-1: A substantial adverse effect on a scenic vista.						
Extended Study Area						
Agricultural Water Use; Municipal/Industrial Water Use ; Wildlife Refuge Water Use	No Substantial Adverse Effect/ Potentially Beneficial Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect/ Potentially Beneficial Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area						
Trinity Lake; Lewiston Lake; Whiskeytown Lake; Shasta Lake; Keswick Reservoir; Sacramento River, Lake Oroville; Thermalito Complex; Trinity River; Klamath River downstream of the Trinity River; Spring Creek; Clear Creek; Feather River; American River; Sutter Bypass; Yolo Bypass; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less Than Significant	Less Than Significant	Less Than Significant	None	N/A
Folsom Lake; Lake Natoma	Potentially Substantial Adverse Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	No Impact/ Potentially Beneficial Effect	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	Potentially Significant	Potentially Significant	Potentially Significant	No Feasible Mitigation	Significant and Unavoidable
Sites Reservoir Dams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Recreation Areas	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	Beneficial Effect	Beneficial Effect	Beneficial Effect	None	N/A
Road Relocations and South Bridge	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	No Feasible Mitigation	Significant and Unavoidable

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	A	B	C	Mitigation Measure	Level of Significance With Mitigation
Sites Pumping/ Generating Plant; Sites Electrical Switchyard; Field Office Maintenance Yard; Tunnel; Sites Reservoir Inlet/Outlet Structure; Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR; TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Swtichyard, GCID Canal Connection to the TRR	N/A	/			None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	Potentially Significant	Potentially Significant	Potentially Significant	No Feasible Mitigation	Significant and Unavoidable
Delevan Transmission Line	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline	N/A	No Impact	No Impact	No Impact	None	N/A
Delevan Pipeline Intake/Discharge Facilities; Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Vis-2: Substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.						
Extended Study Area						
Agricultural Water Use; Municipal/Industrial Water Use; Wildlife Refuge Water Use; Other Reservoirs	No Substantial Adverse Effect/ Potentially Beneficial Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect/ Potentially Beneficial Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake; Lewiston Lake; Whiskeytown Lake; Shasta Lake; Keswick Reservoir; Sacramento River, Lake Oroville; Thermalito Complex; Trinity River; Klamath River downstream of the Trinity River; Spring Creek; Clear Creek; Feather River; American River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Impact Visual-3: Substantial degradation of the existing visual character or quality of the site and its surroundings.						
Extended Study Area						
Agricultural Water Use; Municipal/Industrial Water Use; Wildlife Refuge Water Use; Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake; Lewiston Lake; Whiskeytown Lake; Shasta Lake; Keswick Reservoir; Lake Oroville; Thermalito Complex; Trinity River; Klamath River downstream of the Trinity River; Spring Creek; Clear Creek; Feather River; American River; Sutter Bypass; Yolo Bypass; Sacramento River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Folsom Lake; Lake Natoma	Potentially Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3b: Reduce Operational Impacts Causing Adverse Permanent Impacts on Visual Quality of the Site	Significant and Unavoidable
Sites Reservoir Dams	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Recreation Areas	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Road Relocations and South Bridge	N/A				None	N/A
Construction and Maintenance	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3a: Reduce Construction and Maintenance Impacts Causing Adverse Temporary Impacts on Visual Quality of the Site	Less than Significant
Operations	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3b	Significant and Unavoidable
Sites Electrical Switchyard; Field Office Maintenance Yard; Holthouse Reservoir Electrical Switchyard	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3b	Less than Significant
TRR; TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR	N/A				None Required	N/A
Construction and Maintenance	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Vis-3a	Less than Significant
Operations	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3b	Significant and Unavoidable
TRR Pipeline, TRR Pipeline Road, Delevan Transmission Line; Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-3a	Less than Significant
Operation	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Delevan Pipeline Intake/Discharge Facilities; Project Buffer	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Vis-4: A new source of substantial light or glare which would adversely affect day or nighttime views in the area.						
Extended Study Area						
Agricultural Water Use; Municipal/Industrial Water Use; Wildlife Refuge Water Use; Other Reservoirs	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
San Luis Reservoir	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Secondary Study Area						
Trinity Lake; Lewiston Lake; Whiskeytown Lake; Shasta Lake; Keswick Reservoir; Lake Oroville; Thermalito Complex; Trinity River; Klamath River downstream of the Trinity River; Sacramento River, Spring Creek; Clear Creek; Feather River; Folsom Lake; Lake Natoma; American River; Sutter Bypass; Yolo Bypass; Sacramento River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; San Francisco Bay	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Pump Installation at the Red Bluff Pumping Plant	N/A	No Impact	No Impact	No Impact	None	N/A
Primary Study Area	No Substantial Adverse Effect				None	N/A
Sites Reservoir Inundation Area	N/A				None	N/A
Construction	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
Operation	N/A	Potentially Significant	Potentially Significant	Potentially Significant	No Feasible Mitigation	Significant and Unavoidable
Recreation Areas; Delevan Transmission Line	N/A				None	N/A
Construction	N/A	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Less than Significant/ Potentially Significant	Vis-4a: Reduce Construction and Maintenance Impacts Causing Substantial Light or Glare	Less than Significant
Operations	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-4b: Reduce Operational Impacts Causing Substantial Light or Glare	Less than Significant

Table ES-3
Summary of Environmental Effects by Resource

Impact	Level of Significance by Alternative				Recommended Mitigation	
	No Project/ No Action Alternative	**A**	**B**	**C**	**Mitigation Measure**	**Level of Significance With Mitigation**
Road Relocations and South Bridge	N/A				None	N/A
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-4a	Less than Significant
Operations	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-4b	Less than Significant
Sites Reservoir Dams, Sites Pumping/ Generating Plant; Sites Electrical Switchyard; Field Office Maintenance Yard; Tunnel; Sites Reservoir Inlet/Outlet Structure; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard, Delevan Pipeline, Delevan Pipeline Intake/Discharge Facilities	N/A	Less than Significant	Less than Significant	Less than Significant	None	N/A
TRR; TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR	N/A					
Construction	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-4a	Less than Significant
Operations	N/A	Potentially Significant	Potentially Significant	Potentially Significant	Vis-4b	Less than Significant
Project Buffer	N/A	No Impact/ Less than Significant	No Impact/ Less than Significant	No Impact/ Less than Significant	None	N/A
31. Power Production and Energy						
Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities						
Extended Study Area	No Substantial Adverse Effect	No Impact	No Impact	No Impact	None	N/A
Secondary Study Area	No Substantial Adverse Effect	No Impact/Less than Significant	No Impact/Less than Significant	No Impact/Less than Significant	None	N/A
Primary Study Area	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities						
Extended Study Area	No Substantial Adverse Effect	No Impact	Less than Significant	Less than Significant	None	N/A
Secondary and Primary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A
Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy						
Extended, Secondary and Primary Study Areas	No Substantial Adverse Effect	Less than Significant	Less than Significant	Less than Significant	None	N/A

1. Introduction

1.1 Proposal and Lead Agencies

This Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS) has been prepared by the California Department of Water Resources (DWR) and the U.S Department of the Interior (DOI), Bureau of Reclamation, Mid-Pacific Region (Reclamation) to address the potential effects of alternative plans for the North-of-the-Delta Offstream Storage (NODOS) Project. The NODOS Project described in this document has been developed as part of the NODOS Investigation.

This chapter contains background information regarding DWR and Reclamation; describes the purpose of and need for the proposed Project, including discussion of Project objectives; describes the authorizations for DWR and Reclamation to study NODOS; summarizes the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) requirements for this DEIR/EIS; and provides a general overview of the environmental process for this DEIR/EIS.

DWR is serving as the State lead agency for compliance with CEQA. DWR was created in 1956 to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments. One of DWR's primary responsibilities is to operate and maintain the State Water Project (SWP), which delivers water to agricultural, municipal, and industrial contractors in the Central Valley, the San Francisco Bay Area, upper Feather River areas, central coast, and southern California. Of the contracted water supply, approximately 75 percent goes to municipal and industrial users and 25 percent to agricultural users. One of DWR's goals is to protect and improve the water resources and dependent ecosystems of statewide significance, including the Sacramento-San Joaquin Bay-Delta Estuary. DWR's responsibilities and goals have informed this investigation. The DWR contact person for the proposed Project is:

Mr. Sean Sou
California Department of Water Resources
901 P Street
Sacramento, CA. 95814
sean.sou@water.ca.gov
Fax: (916) 651-9292

Reclamation is serving as the federal lead agency for compliance with NEPA. Reclamation was established in 1902 to assist in meeting the increasing water demands of the West. The mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. Reclamation is the largest water provider in the country and the second largest producer of hydroelectric power in the western United States. Reclamation's Mid-Pacific Region is responsible for managing the Central Valley Project (CVP), which stores and delivers approximately 20 percent of the state's developed water – up to seven million acre-feet (MAF) annually – to more than 250 water contractors throughout California. Of the contracted water supply, approximately 70 percent goes to agricultural users, 20 percent is dedicated to fish and wildlife habitat, and 10 percent goes to municipal and industrial users. The Reclamation contact person for the proposed Project is:

Ms. Sharon McHale
U.S. Bureau of Reclamation
2800 Cottage Way, MP-700
Sacramento CA. 95825
smchale@usbr.gov
Fax: (916) 978-5094

The NODOS Project has been investigated by DWR and Reclamation in coordination with cooperating and responsible agencies, other resource agencies, stakeholders, and the public. The study is consistent with the 1983 U.S. Water Resources Council *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&Gs) (WRC, 1983), NEPA, CEQA, and other pertinent federal, State, and local laws and policies. The NODOS Project includes both this DEIR/EIS and the accompanying feasibility report and appendices. While the DEIR/EIS describes the potential effects of NODOS Project alternatives, the draft feasibility report highlights the potential costs and benefits of the alternatives.

1.2 Purpose and Need and Project Objectives

Purpose and need and project objectives are important elements of an EIR and an EIS, as they document the reasons for a project. CEQA requires a statement of project objectives. NEPA requires a statement of the purpose and need for the action. This section describes the purpose and objectives of the proposed Project and need for the action.

1.2.1 Purpose Statement and Project Objectives

The purpose of the proposed Project is to build offstream surface storage located north of the Delta. The proposed Project's primary objectives are to:

- Improve water supply reliability for agricultural, urban, and environmental uses
- Increase survival of anadromous and endemic fish populations
- Improve environmental and drinking water quality in the Delta
- Provide flexible hydropower generation to support integration of renewable energy sources

The secondary objectives for the proposed Project, based on opportunities that were identified during formulation of alternatives that met the primary objectives, are to:

- Develop additional recreation opportunities
- Provide incremental flood damage reduction opportunities

An initial step in the planning process is to identify and then define problems, needs, and opportunities. Consistent with the requirements of CEQA, NODOS Project objectives were derived from this needs assessment. Needs and objectives were considered and developed in an iterative manner so that a more thorough understanding of each need and objective could be developed. DWR and Reclamation have relied upon several sources of information during the NODOS Project's needs and objectives development process. The CALFED Bay-Delta Program (CALFED Program), for example, provided a comprehensive overview of California's water resources needs. In addition to their water management responsibilities, DWR and Reclamation have also developed water resources planning information related to water resources needs. CALFED and the lead agencies also provided opportunities for input related to needs from State and federal resources agencies, local and regional water interests, and the public. The need for the proposed Project is described below, including background provided by the CALFED Program.

1.2.1.1 CALFED Bay-Delta Program and North-of-the-Delta Offstream Storage

The NODOS Project is derived from and relies upon information developed by and for the CALFED Program. However, the NODOS Project DEIR/EIS is not programmatically tiered from the CALFED Program.

The CALFED Program was established to "develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system" (CALFED, 2000). The CALFED Program identified the need for up to six million acre-feet of additional storage, including an additional three million acre-feet of storage north of the Delta. The CALFED Program sought to build a framework for managing California's water resources, stating that "expanding water storage capacity is critical to the successful implementation of all aspects of the CALFED Program. Not only is additional storage needed to meet the needs of a growing population, but, if strategically located, it will provide much needed flexibility in the system to improve water quality and support fish restoration efforts. Water supply reliability depends upon capturing water during peak flows and during wet years, as well as more efficient water use through conservation and recycling" (CALFED, 2000). The CALFED Program began in May 1995 to address the complex issues that surround the Bay-Delta with a cooperative interagency effort of 18 State and federal agencies with management or regulatory responsibilities for the Bay-Delta. In addition, the CALFED Program was a collaborative effort including representatives of agricultural, urban, environmental, fishery, and business interests, Indian tribes and rural counties who have contributed to the process.

The CALFED Program objectives were fourfold: 1) to restore the ecological health of a fragile and depleted Bay-Delta estuary; 2) to improve the water supply reliability for the State's farms and growing cities that draw water from the Delta and its tributaries, including seven million acres of the world's most productive farmland; 3) to protect the drinking water quality of the 27 million Californians who rely on the Delta for their supplies; and 4) to protect the Delta levees that ensure its integrity as a conveyance and ecosystem. Surface storage is part of an overall water management strategy that incorporates other CALFED Program actions, such as conservation, water use efficiency, conveyance, transfers, groundwater storage and conjunctive use, and habitat restoration to meet these Program objectives.

In 1997, DWR initiated the North-of-the-Delta Offstream Storage Investigation, which Reclamation joined later. Consistent with CALFED's surface storage screening (described in Chapter 2 Alternatives Analysis), the Investigation considered four potential reservoir locations north-of-the-Delta. Evaluations and determinations for each reservoir location are included in this DEIR/EIS. Refer to Chapter 2 Alternatives Analysis for a more detailed history of the CALFED Program, its relationship to the NODOS Project, and the evaluation of the four reservoir locations. The NODOS Project would help provide the needed additional north-of-the-Delta surface storage identified by the CALFED Program. The CALFED Record of Decision (ROD) (CALFED, 2000) suggested several objectives for consideration by the NODOS Project, including water supply reliability, fish survival, and water quality, and identified a need for additional operational flexibility that is described below.

1.2.1.2 Needs and Project Objectives

As noted above, the NODOS Project identified six needs and opportunities that are the basis of the primary and secondary objectives. The NODOS Project also identified one additional need: operational flexibility. Following is a description of the needs and opportunities identified by the NODOS Project.

1.2.1.3 Water Supply Reliability for Agricultural, Urban, and Environmental Uses

The California Water Plan Update identifies two supporting elements to achieve the State's vision for water resources: sustainable water uses and reliable water supplies. Water managers and users are concerned with both the quantity and frequency of their supplies, which are direct measures of water supply reliability. For surface water systems such as the CVP and SWP, the reliability for a particular user is determined by both runoff and system-specific needs and capabilities. In drier years, there is less water available for delivery than in wetter years. System needs include the total water user demand on the system and requirements such as water quality standards, instream flows for habitat or species, and flood operations. The following provides examples of reliability challenges in California.

Water supply reliability requires the delivery of specified amounts of water at predictable locations and times. A review of DWR's SWP Delivery Reliability Reports since 2002 (2002, 2005, 2007, 2009, and 2011) indicates declining SWP reliability. Average SWP delivery reliability has been reduced by almost 500,000 acre-feet. However, limitations on water exports during wet conditions have resulted in greater reservoir storage during drought conditions, and that in turn has slightly increased drought delivery reliability. Despite marginal reliability improvements in drier conditions, additional reliability is still needed. The CVP has experienced similar reductions in delivery reliability.

During prolonged droughts (such as 1987 to 1992 and 2007 to 2009) or multiple dry years, water in storage is reduced and water supplies are less reliable, which increases competition among water users. This competition is exacerbated by increased environmental requirements and reduced natural rainfall for agriculture. A new surface storage reservoir would provide a means of improving water supply reliability, especially during drier periods.

From a planning perspective, emergency response has been incorporated into the water supply reliability objective. By improving water in storage at any given time, operators would have additional water available in storage to respond to specific types of emergencies, including emergency water supply for maintenance of Delta salinity following a levee failure.

In addition, California's mountain snowpack is melting earlier in spring and is projected to decrease over time, and sea level rise along the coast is beginning to threaten Delta water supplies and estuarine habitat as seawater intrudes into the Delta. Runoff is concentrated during shorter periods, and additional water is required to maintain Delta water quality. In addition to impacting water in storage, all of these effects tend to diminish water supply reliability. The additional storage provided by the proposed Project would help mitigate and adapt to these reliability trends.

1.2.1.4 Survival of Anadromous and Endemic Fish Populations

Populations of anadromous and endemic fish species within the Sacramento Valley river system and Bay-Delta are declining. The primary causes of the anadromous fish species decline have been identified as barriers to historic habitat, habitat degradation, predation from introduced species, reduced instream flows, and increased water temperatures (NMFS, 2009). Several potential causes of fish species declines in the Bay-Delta have been identified, including a combination of reduced habitat suitability (such as changing salinity), reduced food sources, entrainment, invasive species, predation, and toxins (Baxter et al., 2010). Onstream dams block many of the native anadromous species from their historic spawning areas. This impact of onstream dams is partially mitigated with cold water releases that keep the water downstream of the dams cold enough to provide limited spawning and rearing habitat. Similar to deliveries, water temperature has a reliability that is based upon operations and hydrology. The reliability of cold water in these streams can be increased and temperatures for anadromous fish can be improved by both maintaining additional water in storage year to year and releasing additional water at specific times to improve temperatures. Additional water in storage can also be released to improve Delta outflow. These actions must be balanced and coordinated with water deliveries to achieve desirable conditions. Additional storage from the proposed Project would provide a source of additional water within the SWP and CVP systems that could be used to facilitate several ecosystem restoration and enhancement actions to improve conditions in the Delta and Sacramento River watershed.

1.2.1.5 Water Quality

Water quality concerns associated with the Delta include salinity and toxins (e.g., pesticides, dissolved ammonia, and methyl mercury) from up-river sources. The CVP and SWP systems currently meet water quality requirements by releasing additional water from upstream reservoirs. Additional water in storage from new proposed Project storage could improve Delta water quality by providing higher-quality supplemental flows dedicated to Delta outflow during periods when Delta water quality is impaired. Water quality improvements would benefit drinking water quality for urban customers, irrigation, and the Bay-Delta ecosystem.

1.2.1.6 Flexible Hydropower Generation

California's renewable energy goal is to increase the portion of energy produced by renewable sources in the State to 33 percent by 2020. By law, a hydroelectric generation facility that exceeds 30 megawatts is ineligible to be considered a renewable electrical generation facility, so none of the electricity generated by the proposed Project could be counted towards that goal (Pub. Util. Code, § 399.12). Nevertheless, the design and operation of the proposed Project would take advantage of other intermittent renewable energy sources such as wind and solar, which are less reliable than other non-renewable sources of energy. There is a need to match renewable energy sources with reliable and flexible generation energy sources to cover short-term gaps in generation, such as when winds diminish in wind generation-intensive areas. The proposed Project would be built with pumping/generating plants capable of producing hydropower. Electricity would be generated when water is released from the proposed Sites Reservoir into the proposed Holthouse Reservoir, and from the proposed Holthouse Reservoir to the proposed Terminal Regulating Reservoir and into the Sacramento River. The proposed Project would also be capable of daily pump-back operations. In pump-back operations mode, water would be released from the proposed Sites Reservoir into the proposed Holthouse Reservoir during on-peak hours to generate electricity, and water would be pumped back into the proposed Sites Reservoir during the off-peak hours to complete the pump-back operations cycle. Additional storage provided by the proposed Project could facilitate flexible hydropower generation, which could be quickly ramped up or down to complement wind or solar generation to meet power demands and support reliable operation of the power grid. Hydropower provided by the proposed Project could be brought online relatively quickly, and would be well suited to provide flexible generation. The effect would be to operate the reservoir like a battery, charging it with renewable energy such as wind when that energy was available but underutilized, and then producing energy during times of peak demand. Hydropower, when paired with solar and wind energy, could reduce greenhouse gas emissions associated with the use of non-renewable sources of energy.

1.2.1.7 Additional Recreation Opportunities

Generally, large metropolitan areas, such as Sacramento, have high demands for water-oriented recreational opportunities. Some of these demands are served by reservoirs on the western slope of the Sierra Nevada. However, as population increases in the Sacramento Valley, demands for flat water, river, and land-based recreation are expected to increase. The planning of any reservoir north of the Delta provides an opportunity to develop new recreational facilities and provide additional opportunities for recreation activities such as fishing, swimming, camping, boating, and hiking. The proposed Project would provide up to five new recreation areas.

1.2.1.8 Incremental Flood Damage Reduction

Offstream storage can provide incremental flood damage reduction improvements to areas located immediately downstream of the reservoir that are prone to flooding. The proposed Project would not dam a major stream, but would dam two ephemeral creeks that are known to cause local flood damage. The proposed Project would therefore provide local flood damage reduction.

1.2.1.9 Operational Flexibility

Operational flexibility was identified as a need by both the CALFED Program and the NODOS Project. Operational flexibility can be defined as the ability of water systems to adapt and respond to changing or uncertain conditions. Water in storage is a metric of operational flexibility; increased water in storage provides increased operational flexibility for a system by allowing system operators and water managers to do more. Water managers employ the flexibility of the systems they manage to accomplish a variety of water management objectives. As noted above in the discussion of Project objectives, additional water in storage can be used to deliver more water to users, improve ecosystem conditions within the system, or improve water quality. In this sense, operational flexibility has a direct relationship with water management generally, and with meeting water management objectives specifically.

California’s water management challenges include growing drought impacts, declining ecosystems, diminishing water quality, increasing climate change impacts to the State’s hydrology, increasing flood risk, and aging infrastructure (DWR, 2009). The California Water Plan Update (DWR, 2009) notes that, “the entire system—water and flood management, watersheds, and ecosystems – has lost its resilience and is changing in undesirable ways.” This loss of resiliency is the result of decreased operational flexibility.

An example of the loss of operational flexibility in the State’s water systems is the declining trend of end-of-water-year storage. Shasta Lake is California’s largest reservoir and the largest storage facility of the CVP. The water stored in Shasta Lake represents approximately 41 percent of the total storage capacity of the CVP (Reclamation, 2013). Lake Oroville is the State’s second largest reservoir and keystone of the SWP. Figure 1-1 shows the trend in Shasta Lake end-of-water-year storage (i.e. water in storage) from 1953 to 2012. Figure 1-2 shows the trend in Lake Oroville end-of-water-year storage from 1968 to 2012. The trend of end-of-water-year storage is diminishing, from over 3 million acre-feet to under 2.5 million acre-feet at Shasta Lake, and from 2.4 million acre-feet to approximately 1.8 million acre-feet at Lake Oroville. Generally, there is less water in storage at the beginning of each water year (i.e. end of September) than has been available over the history of either reservoir. There are likely many reasons for these trends[1]. However, consideration of the operational changes over time associated with the State’s

[1] Fundamentally, water in storage is directly related to two factors: inflow (i.e. hydrology) and releases (i.e. operations). The trend of inflow to the Shasta Lake is essentially flat (i.e. has not varied over time), with a slight upward trend. The Lake Oroville inflow trend is diminishing, but at a slower rate than storage. Therefore, it is likely that the diminishing trend in end of water year storage is due primarily to changes in operations over time. Some highlights of these changes are generally described in the text.

two largest water systems is helpful to understand these trends. When the CVP and SWP were first constructed, the systems had operational flexibility. Deliveries and regulatory requirements were less; both have increased over time. The flexibility that the systems originally possessed has been used to meet the greater delivery amounts and increasing regulatory requirements needed to protect habitats and species.

Today, the CVP and SWP systems do more than ever, including increased deliveries to agricultural, urban, and environmental (refuge supply) users, as shown in Figure 1-3. The reservoirs are serving more purposes than they have historically. Due to changing regulatory requirements, the quantities of water needed to meet Delta water quality standards have increased. The quantities of water dedicated to habitat and ecosystem functions are greater as well, including new commitments associated with the CVP Improvement Act in 1992 (CVPIA) and years following, as well as the 2008 and 2009 Biological Opinions for the protection of both Delta and upstream fish species. Consequently, the CVP and SWP water systems have lost flexibility in timing, location, and capacity to meet these multiple objectives, resulting in increased competition and conflicting demands for limited water in storage. All of these increasing commitments are affecting the system reservoirs generally, and Shasta Lake and Lake Oroville specifically, which can be seen in the decreasing end-of-water-year storage trends.

Requested contract delivery amounts and actual deliveries have also increased over time for both the CVP and SWP. For example, historical deliveries from the Delta are shown in Figure 1-3. These Delta deliveries are both the largest and most variable portion of CVP and SWP deliveries. Chronologically, deliveries reached a peak around 1990 and then varied with runoff and operational limits over the next two decades. Without significant improvements to north of Delta storage, a continuing trend of diminishing end-of-September storage into the future is likely. While the effect of the 1992 CVPIA should be fully reflected in the historic trend, now twenty years after implementation, the effects on the trend of the 2008 and 2009 Biological Opinions are not.

In addition, it is anticipated that the system will be more constrained in the future, with increasing challenges due to the effects of increasing temperatures, sea-level rise, and variability and uncertainty from changing snow and rainfall patterns. For example, climate scientists expect that California's natural water storage in the form of snow, which water managers and operators rely on for more effective reservoir storage operations, will diminish. Sea-level rise will require additional water to be dedicated to salinity repulsion in the Delta, including additional releases from upstream reservoirs. These changes will further diminish reservoir storage and the operational flexibility of the systems that depend on them. These and other effects associated with climate change are described in greater detail in Chapter 25 Climate Change and Greenhouse Gas Emissions.

Additional water in new storage, such as additional water in a new offstream storage reservoir located north of the Delta, would contribute to increased system flexibility. From a system perspective, operational flexibility can be assessed by evaluating the additional water in storage that can be used to meet existing and future water demands. To achieve this kind of flexibility, additional storage would be most effective when operationally integrated with existing SWP and CVP facilities. Supplemental north of Delta storage would provide the ability to increase the water in storage in existing system reservoirs such as Shasta Lake, Lake Oroville, Trinity Lake, and Folsom Lake. The additional water in new offstream storage and increasing water levels in existing reservoirs can meet a larger set of system objectives. For example, water users and ecosystem needs immediately downstream of existing reservoirs need additional water in those reservoirs to meet those needs; additional water in new offstream storage alone would not improve the system's ability to meet needs below existing reservoirs without integration.

The total improvement in flexibility would be both additional water in existing reservoirs and additional water in new offstream storage.

This type of effective additional storage would be able to provide a wide range of water resources benefits throughout the State, including increased water supply reliability for agricultural, environmental, municipal, and industrial uses; water quality maintenance and improvement; increased flexible hydropower generation; and maintenance and improvement of aquatic ecosystems. Most of these existing system objectives have operating or allocation rules based upon the amount of water in storage. These rules or operations guidance explicitly acknowledge the relationship between water in storage (i.e. system operational flexibility) and meeting system needs or objectives.

1.3 North-of-the-Delta Offstream Storage Study Authorizations

The CALFED ROD (CALFED, 2000) directed DWR and Reclamation to: 1) complete environmental and planning documentation for the NODOS Project and 2) develop a joint planning program through a Memorandum of Understanding (MOU) with local water interests, counties, and State and federal agencies to carry out the NODOS Project. This DEIR/EIS and the companion draft Feasibility Report constitute the completion of environmental and planning documentation. Following the signing of the CALFED ROD, DWR and Reclamation formed a MOU partnership with local water interests and other State and federal agencies to investigate offstream storage north of the Delta. Local, regional, and other State and federal agency participation has continued during the investigation. DWR received authorization to study the NODOS Project beginning in 1996. Reclamation received feasibility study authority to investigate the NODOS Project in 2003.

State of California authorities for the NODOS Investigation are summarized below:

- **Proposition 204. The Safe, Clean, Reliable Water Supply Act of 1996:** Notwithstanding Section 13340 of the Government Code, the money in the subaccount is hereby continuously appropriated, without regard to fiscal year, to the department, for the administration of this article and for feasibility and environmental investigations for any of the following projects: (a) Off-stream storage upstream of the Delta that will provide storage and flood control benefits in an environmentally sensitive and cost-effective manner.

- **Budget Act, 1997 to 1998:** This act authorized DWR to continue feasibility and environmental studies pertaining to the Sites Reservoir and alternatives. As a result, DWR expanded the 1997 reconnaissance study to a broader investigation.

- **Proposition 50. Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002:** The sum of $825 million shall be available for appropriation by the Legislature from the fund for the balanced implementation of CALFED expenditures and grants pursuant to this chapter shall be limited to…$50 million for surface water storage planning and feasibility studies.

- **Proposition 84. 2006 Safe Drinking Water Bond Act:** The sum of $65 million shall be available to DWR for planning and feasibility studies related to the existing and potential future needs for California's water supply, conveyance, and flood control systems. The studies shall be designed to promote integrated, multi-benefit approaches that maximize public benefits of the overall system including protection of the public from floods, water supply reliability, water quality, and fish, wildlife, and habitat protection and restoration.

Federal authorities for the NODOS Investigation are summarized below:

- **Public Law 108-7. Consolidated Appropriations Resolution, Sec. 215, 2003:** The Secretary of the Interior, in performing CALFED-related activities, may undertake feasibility studies for Sites Reservoir, Los Vaqueros Reservoir Enlargement, and Upper San Joaquin Storage projects. These storage studies should be pursued along with ongoing environmental and other projects in a balanced manner.
- **Public Law 108-137. Energy and Water Development Appropriations Act, Sec. 211, 2003:** The Secretary of the Interior, in performing CALFED-related activities, may undertake feasibility studies for Sites Reservoir, Los Vaqueros Reservoir Enlargement, and Upper San Joaquin Storage projects, hereafter. These storage studies should be pursued along with ongoing environmental and other projects in a balanced manner.
- **Public Law 108-361. CALFED Bay-Delta Authorization Act (2004):** (1) Record of Decision (ROD) as general framework. The ROD is approved as a general framework for addressing CALFED, including its components related to water storage, ecosystem restoration, water supply reliability (including new firm yield), conveyance, water-use efficiency, water quality, water transfers, watersheds, the Environmental Water Account, levee stability, governance, and science. (2) Secretary of the Interior. The Secretary of the Interior is authorized to carry out the activities…to the extent authorized under the reclamation laws, the Central Valley Project Improvement Act (title XXXIV of Public Law 102-575; 106 Stat. 4706), the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), and other applicable law…Description of Activities Under Applicable Law (1) Water storage (i) planning and feasibility studies for (I) the Sites Reservoir in Colusa County.

1.4 CEQA and NEPA Requirements

Both CEQA and NEPA require governmental agencies to evaluate the environmental impacts of their proposed decisions before making formal commitments to carry them out, and that such evaluation be done in detail, and with public involvement. CEQA is a California law and applies to State and local agencies, whereas NEPA is a federal law and applies to federal agencies. For the proposed Project, CEQA requires preparation of an EIR, and NEPA requires preparation of an EIS.

Despite the similarities between the two laws, important differences exist. CEQA requires that State and local government agencies consider the environmental consequences of projects over which they have discretionary authority before taking action on those projects. As described in the *CEQA Guidelines* Section 15121(a), an EIR is a public informational document that assesses the potential environmental effects of the proposed project, as well as identifies mitigation measures and alternatives to the proposed project that could reduce or avoid adverse environmental impacts. CEQA requires that the lead agency (DWR) prepare an EIR if any “potentially significant impacts” are identified that could not be mitigated to a less-than-significant level.

The *CEQA Guidelines* identify several types of EIRs, each applicable to different project circumstances. This EIR was prepared as a Project EIR pursuant to *CEQA Guidelines* Section 15161. This type of EIR focuses primarily on the changes in the environment that would occur as a result of Project implementation, and examines all phases of a particular project (i.e., planning, construction, maintenance, and operation).This DEIR/EIS discloses the Project-level direct, indirect, and cumulative impacts of the alternatives, including a

No Project/No Action Alternative. The CEQA requirement to determine a "significance threshold" for expected impacts presents an important or critical feature of the document. Thresholds of significance are developed using applicable regulations where they exist, or best professional judgment. CEQA requires agencies to implement feasible mitigation measures or feasible alternatives as a means of reducing the severity of significant environmental effects identified in EIRs, and CEQA requires lead agencies to adopt a Mitigation Monitoring and Reporting Plan for changes to the Project that it has adopted to mitigate or avoid significant effects on the environment (*CEQA Guidelines* Section 15097).

Pursuant to NEPA and the Council on Environmental Quality's (CEQ's) NEPA regulations, federal agencies are required to evaluate the environmental effects of an action, including feasible alternatives, and identify mitigation measures to minimize adverse effects when they propose to carry out, approve, or fund a project that may have a significant effect on the environment. Reasonable alternatives must be rigorously and objectively evaluated pursuant to NEPA (as opposed to CEQA's requirement that they be discussed in "meaningful detail"). Pursuant to NEPA, the evaluation of potential impacts must include socioeconomic impacts, whereas CEQA does not require such analysis. Although mitigation is identified in NEPA documents, it is not required to be implemented.

DWR and Reclamation have determined that this combined DEIS/EIR is the most appropriate and accessible means to comply with both CEQA and NEPA because of the complex nature of the proposed Project, need for coordination among federal and State agencies, the need to complete environmental review as expeditiously as possible, and to reduce unnecessary duplication of effort. This document satisfies the requirements of CEQA and NEPA for disclosing environmental impacts and identifying feasible alternatives, mitigation measures, and modifications to the Project that would reduce those impacts.

The alternatives discussed in this DEIR/EIS have been evaluated on an equal non-preferential basis and at an equal level of detail, according to NEPA standards. The Proposed Project/Preferred Alternative will be identified in the Final EIR/EIS (FEIR/FEIS), with that selection to be informed through the CEQA and NEPA processes. Although a final Mitigation Monitoring Plan is not required to be included in an EIR, a draft Mitigation Monitoring Plan has been prepared and included in this DEIR/EIS as Appendix 1A, and is circulated for public and agency review.

1.4.1 Purpose and Intended Use of this DEIR/EIS

CEQA Guidelines Section 15124(d) requires that an EIR contain a statement briefly describing the intended uses of the EIR. The *CEQA Guidelines* indicate that the EIR should identify the ways in which the Lead Agency and any responsible agencies would use this document in their approval or permitting processes. The purpose of this DEIR/EIS is to present the process and overall findings of the NODOS Investigation. This investigation was performed to evaluate the feasibility and impacts of constructing a new water storage facility north-of-the-Delta to improve the flexibility of the SWP and CVP systems to ensure these systems can continue to meet the water supply, water quality, environmental, and energy needs of California.

This DEIR/EIS serves as a companion document to the Draft Feasibility Report, published separately. This DEIR/EIS, and the associated Draft Feasibility Report, is intended to be used by DWR and Reclamation when considering approval of the proposed Project. It provides the needed information for DWR, Reclamation, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW) to support compliance with the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), the Natural Community Conservation Planning Act (NCCPA), and the federal Fish and Wildlife Coordination Act. It also provides needed information for the U.S. Army Corps of Engineers (USACE) and the Regional Water Quality Control Board (RWQCB) in Clean Water Act (CWA) Section 408, 404, and 401 applications, as well as information necessary for USACE to issue a Rivers and Harbors Act Section 10 permit.

1.5 Federal, State, Regional, and Local Requirements

In addition to DWR and Reclamation, several federal, tribal, State, regional, and local agencies, as well as decision-making bodies, have jurisdiction over resources that could be affected by the proposed Project, or have other permitting or regulatory authority over certain aspects of the proposed Project. These agencies and decision makers will review and consider the information contained in the FEIR/EIS for issuance of permits. Table 1-1 describes key consultation requirements for the NODOS Project:

Table 1-1
Anticipated Permits, Approvals and Authorizations for the NODOS Project

Jurisdiction	Responsibility
Federal Agency Permits, Approvals, and Authorizations	
Federal Energy Regulating Commission (FERC)	• Operational changes to existing hydroelectric facilities may necessitate a license amendment from FERC.
National Marine Fisheries Services (NMFS/ NOAA Fisheries)	• Endangered Species Act Section 7 consultation and incidental take authorization • Fish and Wildlife Coordination Act compliance • Magnuson-Stevens Fishery Conservation and Management Act compliance
Natural Resources Conservation Service (NRCS)	• Farmland Protection Policy Act compliance
United States Army Corps of Engineers (USACE)	• Rivers and Harbors Act Section 9 (construction of dikes) and Section 10 (alteration of navigable waters) permitting • Clean Water Act Section 404 (discharge of dredge or fill material) permitting and associated Section 401 water quality certification; Section 408 (levee modification) permitting • Executive Order 11990 (protection of wetlands) compliance
United States Department of the Interior, Bureau of Reclamation (Reclamation)	• NEPA lead agency • Executive Order 12898 (environmental justice) compliance • Executive Order 11988 (floodplain management) compliance
United States Department of the Interior Secretary	• Responsible for publishing the Record of Decision.
United States Department of Justice, Civil Rights Division	• Americans with Disabilities Act compliance
United States Environmental Protection Agency (EPA) California Environmental Protection Agency (Cal-EPA)	• Spill prevention control and countermeasure plan (SPCCP) developed in accordance with United States Code of Federal Regulations (CFR), Title 40, Part 112 (40 CFR 112) • Clean Air Act and State Implementation Plan compliance • Safe Drinking Water Act compliance

Table 1-1
Anticipated Permits, Approvals and Authorizations for the NODOS Project

Jurisdiction	Responsibility
United States Fish and Wildlife Service (USFWS)	• Endangered Species Act Section 7 consultation and incidental take authorization • Fish and Wildlife Coordination Act compliance • Bald and Golden Eagle Protection Act compliance • Migratory Bird Treaty Act compliance • Wild and Scenic Rivers Act compliance
State Agency Permits, Approvals, and Authorizations	
California Air Resources Board	• Criteria pollutant standards compliance
California Department of Boating and Waterways	• California Harbors and Navigation Code compliance
California Department of Conservation	• Designating Important Farmland in the State
California Department of Fish and Wildlife (CDFW)	• Lake and Streambed Alteration Agreement permitting (pursuant to Section 1602 of the California Fish and Game Code) • California Endangered Species Act consultation and incidental take authorization (Section 2081) • Compliance with Fish and Game Code Sections related to fully protected species, birds of prey, native plant protection, invasive species, sufficient fisheries flows below dams, fish screening, and asphalt removal
California Department of Toxic Substances Control	• Compliance with generation, transportation, treatment, storage, and disposal of hazardous waste regulations
California Department of Transportation (Caltrans)	• Issuance of an encroachment and transportation permits • Approval of a transportation management plan
California Department of Water Resources (DWR)	• CEQA lead agency • Conduct environmental site assessment
California Energy Commission	• Compliance with State energy policies
California Office of Historic Preservation	• National Historic Preservation Act Section 106 consultation
California State Lands Commission (CSLC)	• Potential lease from CSLC for work in areas under CSLC jurisdiction (e.g. along Sacramento River)
California Water Commission	• Quantification of public benefits of water storage projects
Central Valley Flood Protection Board	• Levee and floodway encroachment permitting
Delta Stewardship Council	• Delta Plan consistency
Native American Heritage Commission	• Identification of sacred sites and Most Likely Descendants for Native American burials and provision of Native American contact information
Regional and Local Agency Permits, Approvals, and Authorizations	
Colusa and Glenn Counties	• Surface Mining and Reclamation Act (SMARA) permitting or exemption if borrow is required from borrow site(s) not previously permitted under SMARA.
Planning Department	• Issuance of Conditional Use Permit (CUP) • Rezoning of parcels in both counties • Conformance with CEQA environmental review requirements

Table 1-1
Anticipated Permits, Approvals and Authorizations for the NODOS Project

Jurisdiction	Responsibility
Engineering and Surveying Services Department	• Plan approval for any County road or bridge crossings at creeks or grading for structures within 50 feet from the top of creek banks; grading and drainage plan; and grading permit • Erosion control plan development and permitting • Building and electrical permitting • Development of blasting Plan for foundation and roadway installation
Environmental Health Services Department	• Septic and water system permitting
Roads Department	• Encroachment permitting • Construction traffic control plan development for County roads • Assessment of fees for increases in peak-hour trips, if required • Heavy haul permitting • Roadway damage and repair bonds
Fire Department	• Annual permitting for the use and storage of hazardous and flammable materials/wastes • Hazardous materials business plan development • Fire protection plan development
Colusa County Air Pollution Control District (CCAPCD) Glen County APCD	• Emission permitting
State Water Resources Control Board (SWRCB) and Central Valley Regional Water Quality Control Board	• Clean Water Act Section 401 certification Clean Water Act Section 402 National Pollutant Discharge Elimination System (NPDES) permitting (requirements include preparation of a construction stormwater pollution prevention plan [SWPPP] intended to comply with Glenn and Colusa County requirements) • Water rights regulation

All federal, State, regional, and local legislation and policies that were considered during impact evaluations for each of the resource chapters, or that will be used for decision making for the proposed Project, are detailed in Chapter 4 Environmental Compliance and Permit Summary of this DEIR/EIS.

Local and regional coordination has been an important part of the NODOS Project. Subsequent to the passage of the 2009 Comprehensive Water Package, local water interests and counties formed the Sites Project Joint Powers Authority (Sites JPA), which includes water districts and county governments. The Sites Project JPA became a cost-share partner of the NODOS Project when it requested and received State funding in 2011 to help support development of the DEIR/EIS. The Sites JPA is also a cooperating and responsible agency.

1.6 Notice of Preparation and Notice of Intent

DWR filed a Notice of Preparation (NOP) with the State Clearinghouse on November 5, 2001, and Reclamation published a Notice of Intent (NOI) in the *Federal Register* on November 9, 2001 to announce the intent to prepare a joint EIR/EIS for the proposed Project. The NOP/NOI notified the public of the Project proposal, announced the dates and locations of public meetings, and solicited public comments to help guide development of the EIR/EIS, pursuant to CEQA and NEPA, respectively. The NOP/NOI identified the No Project, No Action, Sites Reservoir, and Newville Reservoir alternatives for analysis. The NOP/NOI also identified other potential alternatives, including conjunctive use or Shasta Reservoir enlargement, either as stand-alone projects or in conjunction with other NODOS Project alternatives to meet the NODOS Project objectives.

1.7 Proposed Project/Proposed Action Concept

The proposed Project would consist of a new offstream storage reservoir with two main dams, up to nine saddle dams, and up to five recreation areas. The reservoir would have an associated inlet/outlet structure and would be connected to the Sacramento River by two existing screened canals and a new screened pipeline. Water conveyance between the reservoir and the canals and pipeline would be facilitated by two new regulating reservoirs and their associated pumping/generating plants. A new transmission line would connect the pumping/generating plants and their associated electrical switchyards to an existing transmission line in the proposed Project area. New roads and a bridge would be constructed to provide access to the proposed Project facilities and over the proposed reservoir, and some existing roads would be relocated or improved. The proposed Project would require modifications to an existing canal and pumping plant. A more complete description of the proposed Project can be found in Chapter 3 Description of Proposed Project/Proposed Action and Alternatives. The proposed Project would be operated generally in the following manner (Figure 1-4) to achieve Project objectives and the Project purpose:

- Runoff from tributaries entering the Sacramento River downstream of Keswick Dam, and Shasta Lake releases for flood management operations, would be diverted to the existing Red Bluff Pumping Plant (and then to the T-C Canal), to the existing GCID Pumping Plant (and then to the GCID Canal), and/or to the proposed Delevan Pipeline Intake.
- Water from the screened T-C Canal would be diverted/stored in the proposed Holthouse Reservoir Complex and conveyed to the proposed Sites Reservoir, whenever possible, until Sites Reservoir is filled.
- Water from the screened GCID Canal would be diverted/stored/pumped in the proposed Terminal Regulating Reservoir and conveyed to the proposed Sites Reservoir, whenever possible, until Sites Reservoir is filled.
- Water from the proposed screened Delevan Pipeline Intake would be diverted/stored/pumped in the pumping plant and forebay, and would be conveyed to the proposed Holthouse Reservoir, and to the proposed Sites Reservoir, whenever possible, until Sites Reservoir is filled.
- Water would be released from the proposed Sites and Holthouse reservoirs via the proposed Delevan Pipeline and its associated intake/discharge facilities to the Sacramento River, and electricity would be generated for action alternatives that have a pumping/generating plant at the proposed Delevan Pipeline Intake Facilities.
- Water would be released from the proposed Sites and Holthouse reservoirs to the T-C Canal for diversion to water users, and electricity would be generated.
- Water would be released from the proposed Sites and Holthouse reservoirs to the proposed Terminal Regulating Reservoir and the GCID Canal for diversion to downstream water users, and electricity would be generated.

- Because water would be diverted from the Sacramento River through fish screens to the proposed Sites Reservoir, and releases would be made from the proposed Sites Reservoir back to the Sacramento River and to T-C Canal and GCID Canal water users, operations of existing SWP and CVP facilities throughout the state could be modified to improve flow and water quality conditions for the benefit of anadromous and endemic fish populations; municipal, industrial, and agricultural water users; and wildlife refuges.

DWR and Reclamation developed three action alternatives to meet the primary objectives of the proposed Project. The process that was used to develop the alternatives is described in Chapter 2 Alternatives Analysis. Maps and detailed descriptions of the three action alternatives are provided in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives.

1.8 Proposed Project/Proposed Action Location

The proposed Sites Reservoir would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell, in both Glenn and Colusa counties. Other proposed Project facilities would be located in Tehama, Glenn, or Colusa counties (Figure 1-5).

1.9 Study Areas

The proposed Project has the potential to influence SWP and CVP system operations and water deliveries over a large geographic area. To effectively evaluate the effects of the proposed Project's three action alternatives on environmental resources in different geographic regions, DWR and Reclamation identified three study areas to be evaluated in this DEIR/EIS: the Extended, Secondary, and Primary study areas.

The Extended Study Area, consisting of the SWP and CVP service areas, is the largest and most diverse of the three study areas in terms of size, geography, land use, and habitat conditions. As such, it has been described and evaluated in the resource chapters of this document (Chapters 6 through 31) at the lowest level of detail. The Secondary Study Area is smaller than the Extended Study Area and consists of the SWP and CVP facilities that could be affected by proposed Project operations; this study area has been described and evaluated in the resource chapters in more detail than for the Extended Study Area. The Primary Study Area includes the proposed Project facilities and the land immediately surrounding them that would be included in the proposed Project boundary (referred to in this document as the Project Buffer); as such, this study area is the focus of the resource evaluations in this DEIR/EIS. These three study areas are described in more detail below and are shown in Figure 1-6.

1.9.1 Extended Study Area

The Extended Study Area includes the entire service areas of the SWP and CVP. These two service areas are located within all or portions of the following 39 counties: Alameda, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Imperial, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, and Yolo. The proposed Project's purpose of improved water supply reliability has the potential for long-term direct and indirect effects within these two service areas. The Extended Study Area would also include wildlife refuges that could receive Level 4 water supply from the proposed Project. Those wildlife refuges, which are located within seven counties in the Extended Study Area, are shown on Figure 1-7.

1.9.2 Secondary Study Area

The Secondary Study Area is defined as the area of potential operational effects, including SWP and CVP facilities that could experience water surface elevation fluctuations or stream flow changes. Those facilities are located within the following 22 counties: Alameda, Butte, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Marin, Placer, Sacramento, San Francisco, San Mateo, Santa Clara, Shasta, Solano, Sonoma, Sutter, Tehama, Trinity, Yolo, and Yuba.

Operational changes could occur as a result of the coordinated and integrated operation of the proposed Project's facilities with those State and federal projects located on the American River, Trinity River, Sacramento River, Clear Creek, Spring Creek, Feather River, and the Delta. The Secondary Study Area is shown on Figure 1-8.

1.9.3 Primary Study Area

The Primary Study Area is defined as the areas within Glenn and Colusa counties where short-term and long-term direct effects from constructing, operating, and/or maintaining proposed Project facilities may occur. This study area includes the footprints of the proposed Sites Reservoir Inundation Area and other proposed facilities (e.g., dams, intakes/discharge facilities, fish screens, pipelines, transmission line, pumping/generating plants, recreation areas, road relocation areas, borrow areas, and associated facilities). It also includes the construction disturbance areas, i.e., the footprint of each proposed facility plus the area around each facility that would be disturbed over the short-term by Project-related construction activities, vehicles, and equipment. The Primary Study Area also includes the land parcels that surround those Project facilities; these parcels would be purchased but not developed for the proposed Project and are referred to as the "Project Buffer".

DWR and Reclamation have developed three action alternatives (Alternatives A, B, and C which are described in Chapter 2 Alternatives Analysis) to meet the purpose, need, and objectives of the proposed Project. There are differences in the facilities associated with the three alternatives; therefore, the Primary Study Areas for the three alternatives also differ. The Primary Study Areas associated with Alternatives A, B, and C are shown on Figure 1-9A, Figure 1-9B, and Figure 1-9C, respectively. Detailed descriptions of each proposed Project facility are provided in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives.

1.10 Areas of Controversy/Issues to be Resolved

The following areas of controversy and issues to be resolved have been identified to date through stakeholder meetings or during the preparation of this DEIR/EIS:

- **Impacts on Terrestrial Biological Resources:** Golden eagles have been identified as foraging within the proposed Sites Reservoir Inundation Area and nesting within the proposed recreation areas. USFWS has expressed concern about the potential loss of nesting and foraging habitat for golden eagles, which are protected by the Bald and Golden Eagle Protection Act.
- **Impacts on Project Area Property Owners:** Project development would require the demolition of existing structures, acquisition of private property, and relocation of displaced parties. These actions concern property owners within the Primary Study Area.

1.11 Public Review of the Draft EIR/EIS

This DEIR/EIS is being circulated to local, State, and federal agencies**,** as well as to interested organizations and individuals who may wish to review and comment on it. The DEIR/EIS and a Notice of Completion (NOC) has been filed with the Office of Planning and Research, State Clearinghouse; has been publicly noticed in the *Federal Register* and XX newspapers; and is currently being circulated for a review period of 90 days. During this review period, written comments may be submitted to the DWR and Reclamation representatives listed in Section 1.1 of this chapter.

Comments received in response to the DEIR/EIS will be addressed in a Response to Comments addendum document which, together with the revised DEIR/EIS text, will constitute the FEIR/EIS. DWR will provide a written proposed response to a public agency on comments made by that agency at least 10 days prior to certifying the EIR (Reclamation will provide such comments at least 30 days prior to certifying the EIS as required by NEPA). DWR will then review the proposed Project, the EIR, and the public testimony, and decide whether to certify the EIR and adopt any findings and statements of overriding significance before deciding whether to approve or deny the proposed Project. If the proposed Project is approved, DWR will file a Notice of Determination (NOD) with the Governor's Office of Planning and Research, State Clearinghouse within five days of Project approval. This filing will trigger a 30-day period in which a legal challenge to the document may be filed.

Concurrent with this CEQA process, Reclamation will consider the EIS and Proposed Action, and may issue a ROD for the proposed Project and publish it in the Federal Register.

1.12 Organization of the DEIR/EIS

This DEIR/EIS includes the following chapters:

- **Executive Summary:** This chapter provides a summary of the Project description, a description of issues to be resolved and areas of controversy, the significant environmental impacts that would result from implementation of the alternatives, and mitigation proposed to reduce or eliminate those impacts.
- **Chapter 1 Introduction:** This chapter describes the purpose, need, objectives, authorization, location of the alternatives being evaluated, and the three study areas; provides an overview of the environmental review process and background for the proposed Project; summarizes the intended use of the EIR/EIS, and lists the areas of controversy and issues to be resolved.
- **Chapter 2 Alternatives Analysis:** This chapter describes the approach used to develop the action alternatives that are evaluated in this DEIR/EIS, including a discussion of the evaluation of alternative reservoir locations, reservoir sizes, and conveyance alternatives. It also describes Existing Conditions and the No Project/No Action Alternative.
- **Chapter 3 Description of Proposed Project/Proposed Action and Alternatives:** This chapter describes in detail the proposed Project facilities included in the action alternatives (Alternatives A, B, and C), and describes Project operation for each of the action alternatives.
- **Chapter 4 Environmental Compliance and Permit Summary:** This chapter presents the regulatory framework for the resources chapters (Chapters 6 through 31).

- **Chapter 5 Guide to Resources Analysis:** This chapter describes the process used to develop the environmental setting (i.e., affected environment) and evaluate the environmental impacts (i.e., environmental consequences) of implementing the alternatives, defines types of impacts and levels of significance, describes mitigation measure development and eliminated topics, and summarizes the modeling tools and analytical methods that were used for each resource analysis.
- **Chapters 6 through 31 Resource Chapter Evaluations:** These chapters include descriptions of the environmental setting (i.e., affected environment), contain assessments of the potential impacts of each of three alternatives within each of three study areas, and list mitigation measures for identified significant and potentially significant impacts, where appropriate, for the following resources:
  - Surface Water Resources
  - Surface Water Quality
  - Fluvial Geomorphology and Riparian Habitat
  - Flood Control and Management
  - Groundwater Resources
  - Groundwater Quality
  - Aquatic Biological Resources
  - Botanical Resources
  - Terrestrial Biological Resources
  - Wetlands and Other Waters of the U.S.
  - Geology, Minerals, Soils, and Paleontology
  - Faults and Seismicity
  - Cultural Resources
  - Indian Trust Assets
  - Land Use
  - Recreation Resources
  - Socioeconomics
  - Environmental Justice
  - Air Quality
  - Climate Change and Greenhouse Gas Emissions
  - Navigation, Transportation, and Traffic
  - Noise
  - Public Health and Environmental Hazards
  - Public Services and Utilities
  - Visual Resources
  - Power Production and Energy
- **Chapter 32 Short-term Uses vs. Long-term Productivity:** This chapter describes the short-term uses vs. long-term productivity of the proposed Project.
- **Chapter 33 Irreversible or Irretrievable Commitments of Resources**: This chapter describes the irreversible or irretrievable commitments of resources associated with the proposed Project.
- **Chapter 34 Growth-Inducing Impacts**: This chapter describes the growth-inducing impacts associated with the proposed Project.
- **Chapter 35 Cumulative Impacts**: This chapter describes the cumulative impacts of the proposed Project.

- **Chapter 36 Consultation and Coordination:** This chapter describes the public scoping process and the agencies and organizations that have been consulted throughout the process of the NODOS Investigation.
- **Chapter 37 References:** This chapter lists the sources of information used to prepare the DEIR/EIS. All references are listed by the chapter in which they were cited.
- **Chapter 38 List of Preparers and Contributors:** This chapter lists the individuals who participated in the preparation of this DEIR/EIS, and provides the qualifications for those individuals, in order of organization and agency.
- **Chapter 39 EIR/EIS Distribution List:** This chapter lists the elected officials; governmental departments; federal, tribal, State, and local agencies; special interest groups; and individuals who received notice of availability of this DEIR/EIS.
- **Appendixes:** The appendixes are located at the back of this DEIR/EIS and are listed in the Table of Contents

1.13 Preparers of the DEIR/EIS

This DEIR/EIS has been prepared by a multi-disciplinary team at the direction of the two lead agencies: DWR and Reclamation. Additionally, the lead agencies have actively solicited input and review from cooperating and responsible agencies, notably USFWS, NMFS, CDFW, SWRCB, Central Valley Regional Water Quality Control Board, Sites JPA, Colusa Indian Community Council, Western Area Power Administration (WAPA), USACE, Bureau of Indian Affairs (BIA), and Cortina Indian Rancheria, described in Chapter 36 Consultation and Coordination. Throughout the DEIR/EIS preparation process, input has been solicited and considered from affected parties and agencies, including local governments, interest groups, and individuals. Chapter 38 List of Preparers and Contributors provides a comprehensive list of the individuals involved in the preparation of the DEIR/EIS, and Chapter 39 EIR/EIS Distribution List provides a list of parties that requested to be involved in the proposed Project in some manner.

1.14 References

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Figures

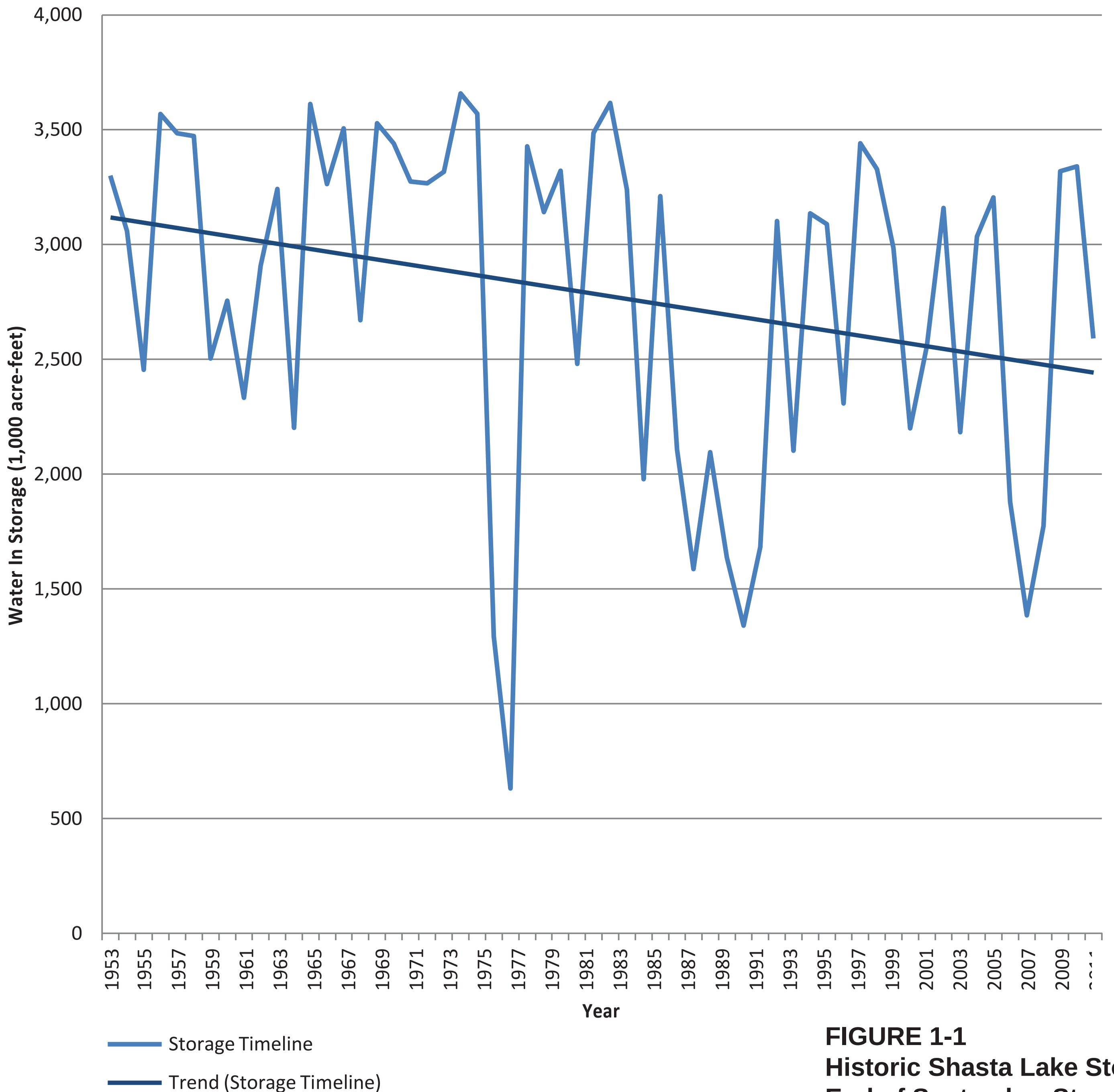

FIGURE 1-1
Historic Shasta Lake Storage Operations
End of September Storage with Trend
North-of-the-Delta Offstream Storage Project

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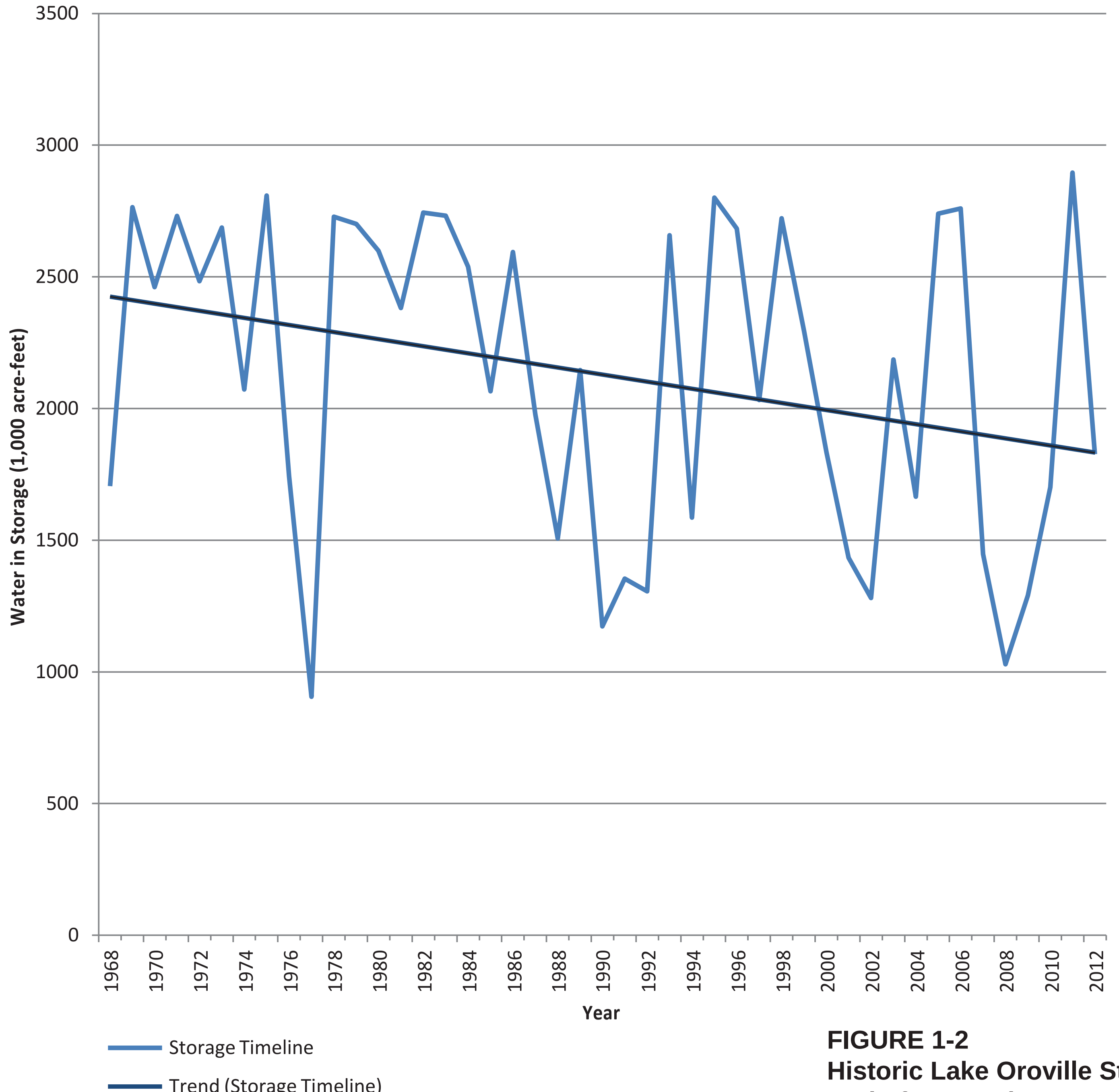

FIGURE 1-2
Historic Lake Oroville Storage Operations
End of September Storage with Trend
North-of-the-Delta Offstream Storage Project

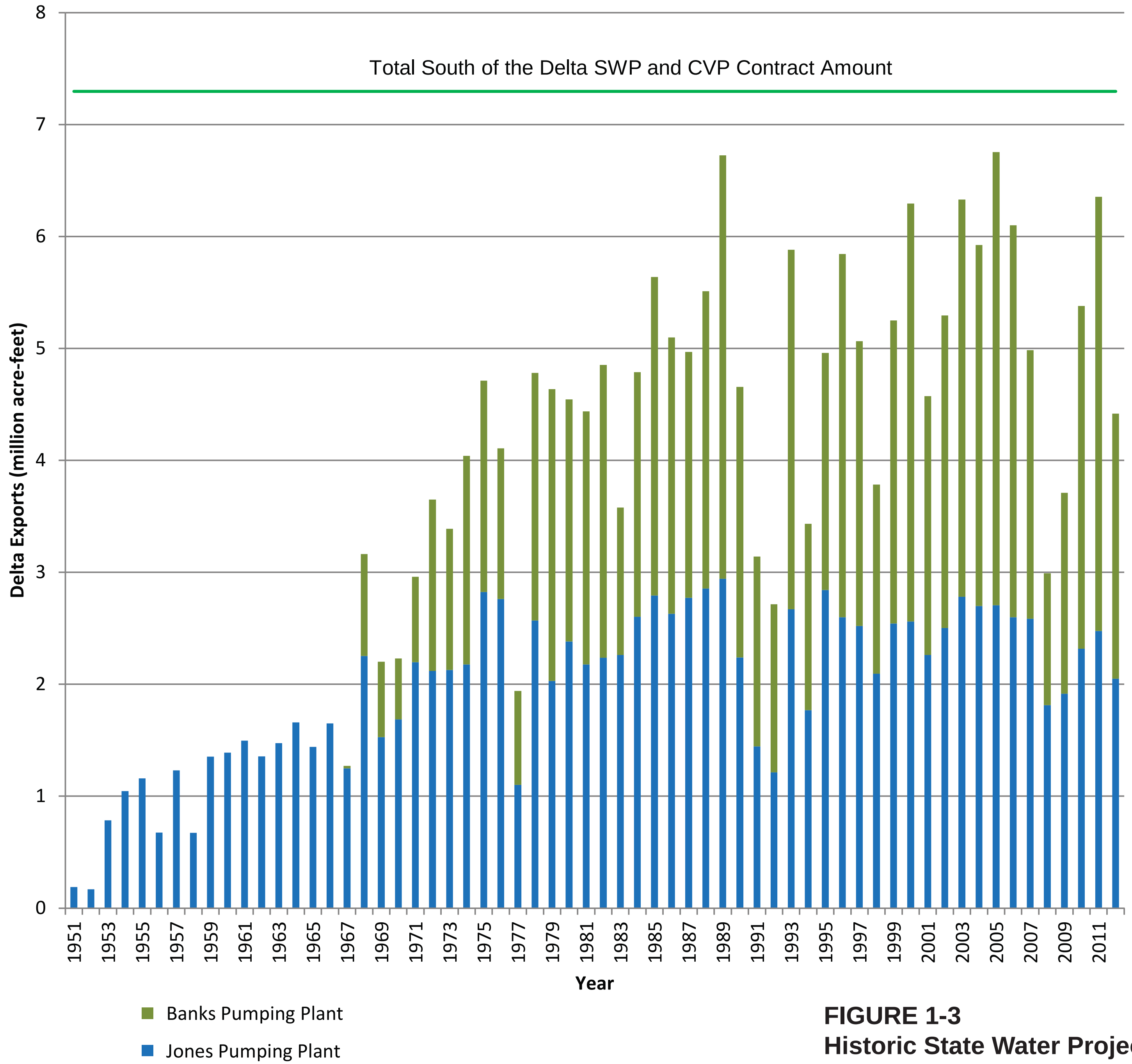

FIGURE 1-3
Historic State Water Project (SWP) and Central Valley Project (CVP) Delta Exports
North-of-the-Delta Offstream Storage Project

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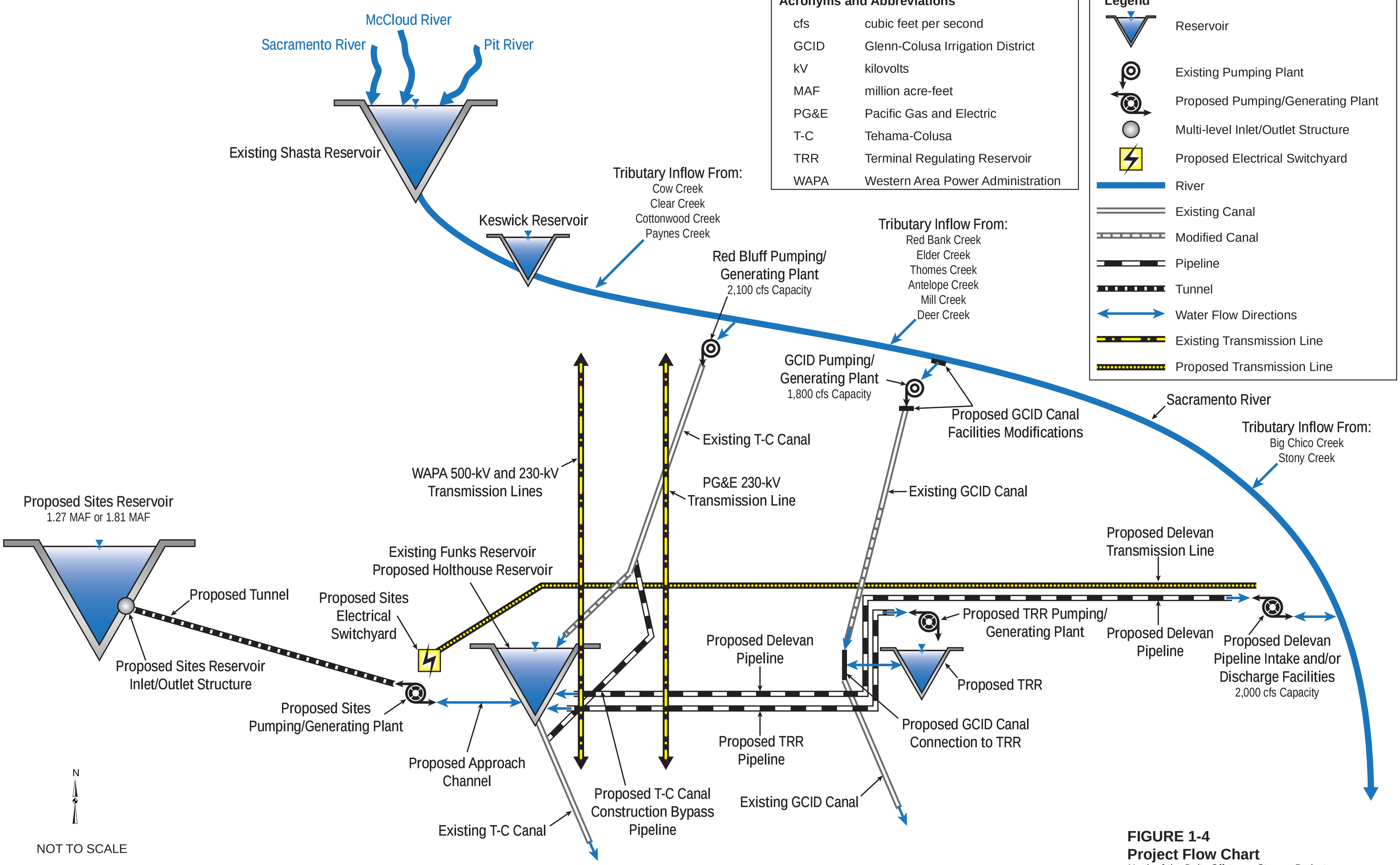


Acronyms and Abbreviations

cfs	cubic feet per second
GCID	Glenn-Colusa Irrigation District
kV	kilovolts
MAF	million acre-feet
PG&E	Pacific Gas and Electric
T-C	Tehama-Colusa
TRR	Terminal Regulating Reservoir
WAPA	Western Area Power Administration

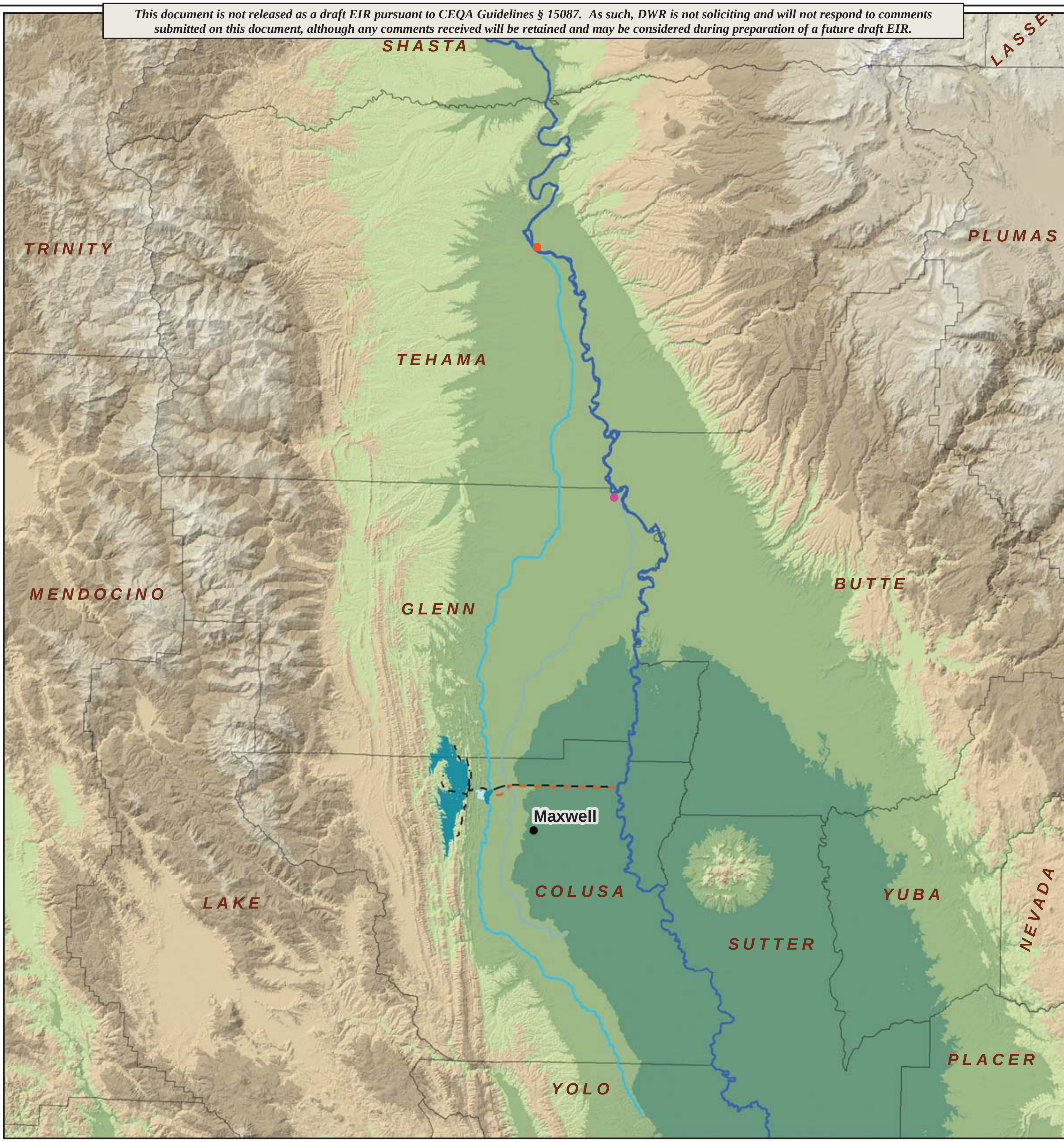
Legend

- Reservoir
- Existing Pumping Plant
- Proposed Pumping/Generating Plant
- Multi-level Inlet/Outlet Structure
- Proposed Electrical Switchyard
- River
- Existing Canal
- Modified Canal
- Pipeline
- Tunnel
- Water Flow Directions
- Existing Transmission Line
- Proposed Transmission Line

FIGURE 1-4
Project Flow Chart
North-of-the-Delta Offstream Storage Project

WBG020812033556SAC

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.



Legend

- Red Bluff Pumping Plant
- GCID Canal Headworks Facility
- Proposed Delevan Transmission Line
- Proposed Delevan Pipeline
- Tehama-Colusa Canal
- Glenn-Colusa Irrigation District Canal
- Proposed Sites and Holthouse Reservoirs
- Existing Funks Reservoir

FIGURE 1-5
Proposed Project/ Proposed Action Facilities
North-of-the-Delta Offstream Storage Project

N

0 5 10 20 30 Miles

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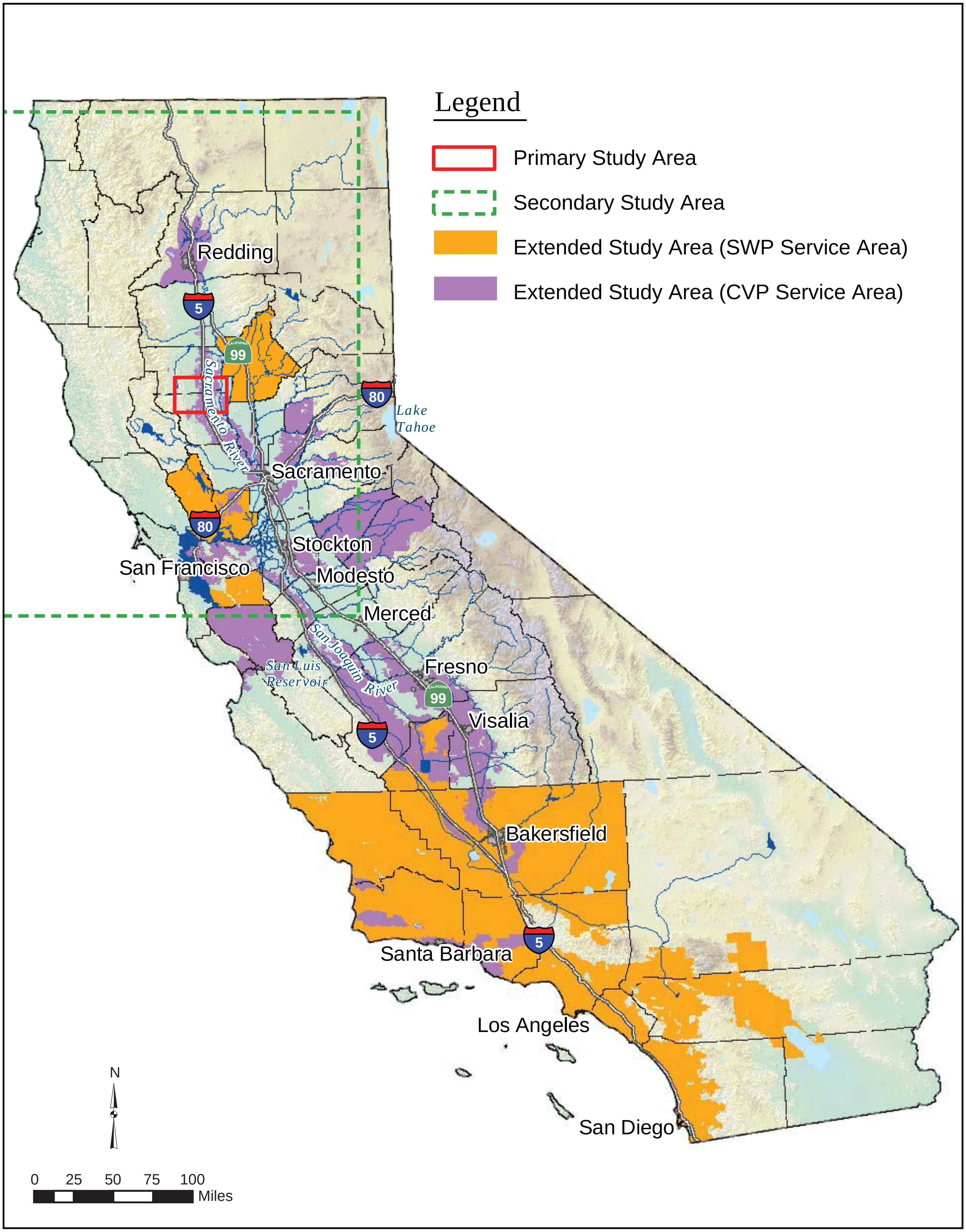

FIGURE 1-6
Primary, Secondary, and Extended Study Areas
North-of-the-Delta Offstream Storage Project

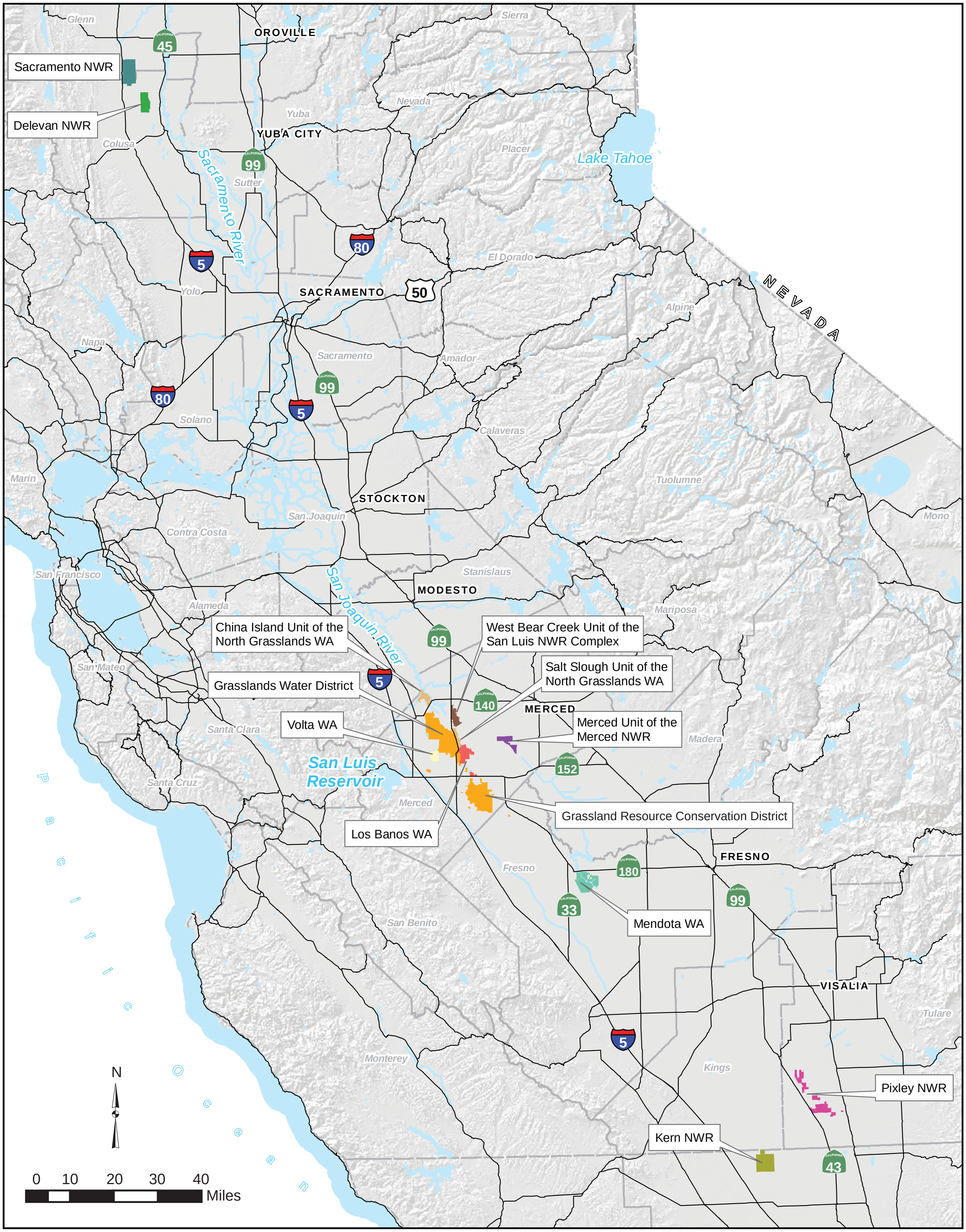

FIGURE 1-7
Level 4 Wildlife Refuges in the Extended Study Area
North-of-the-Delta Offstream Storage Project

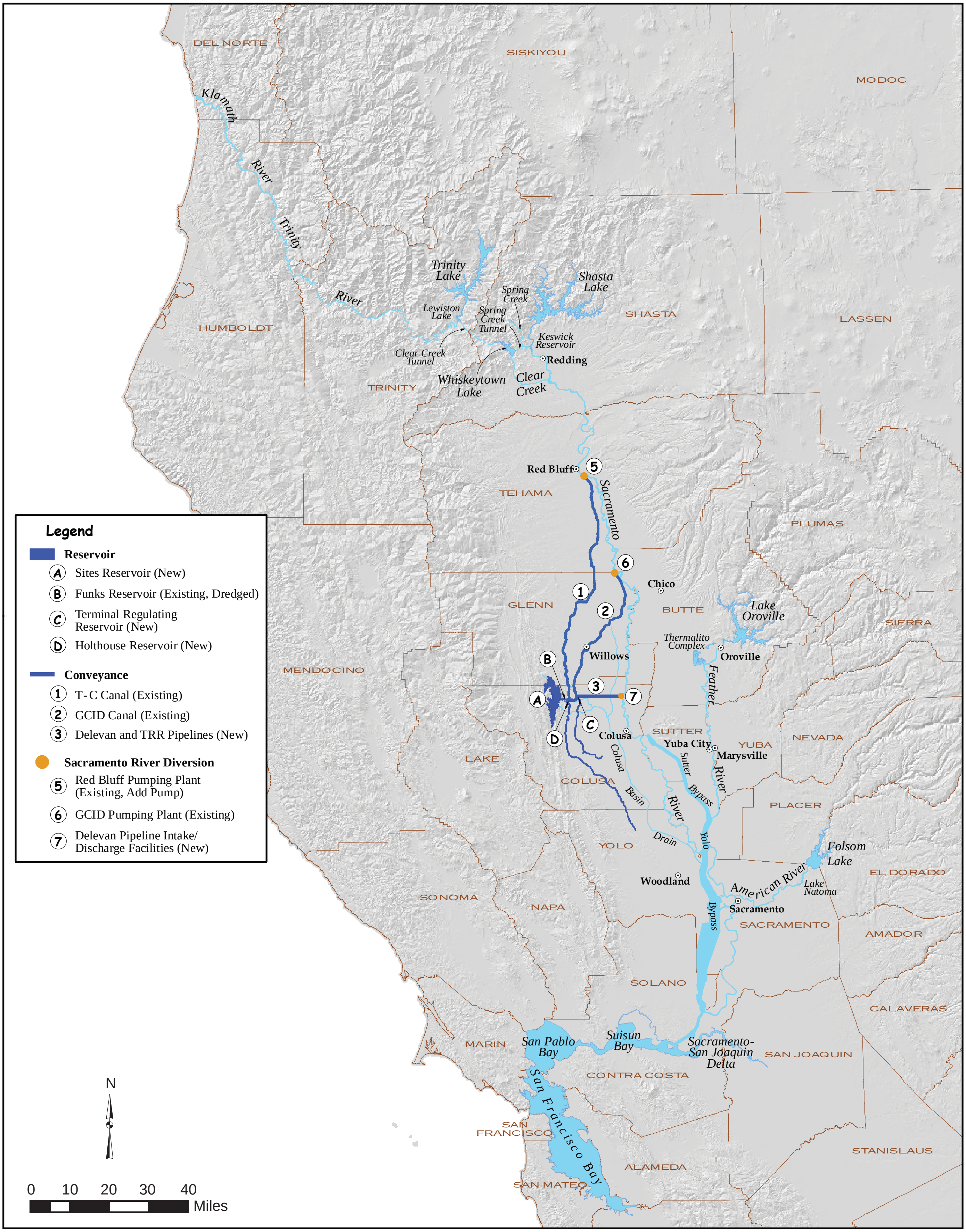

FIGURE 1-8
Secondary Study Area
North-of-the-Delta Offstream Storage Project

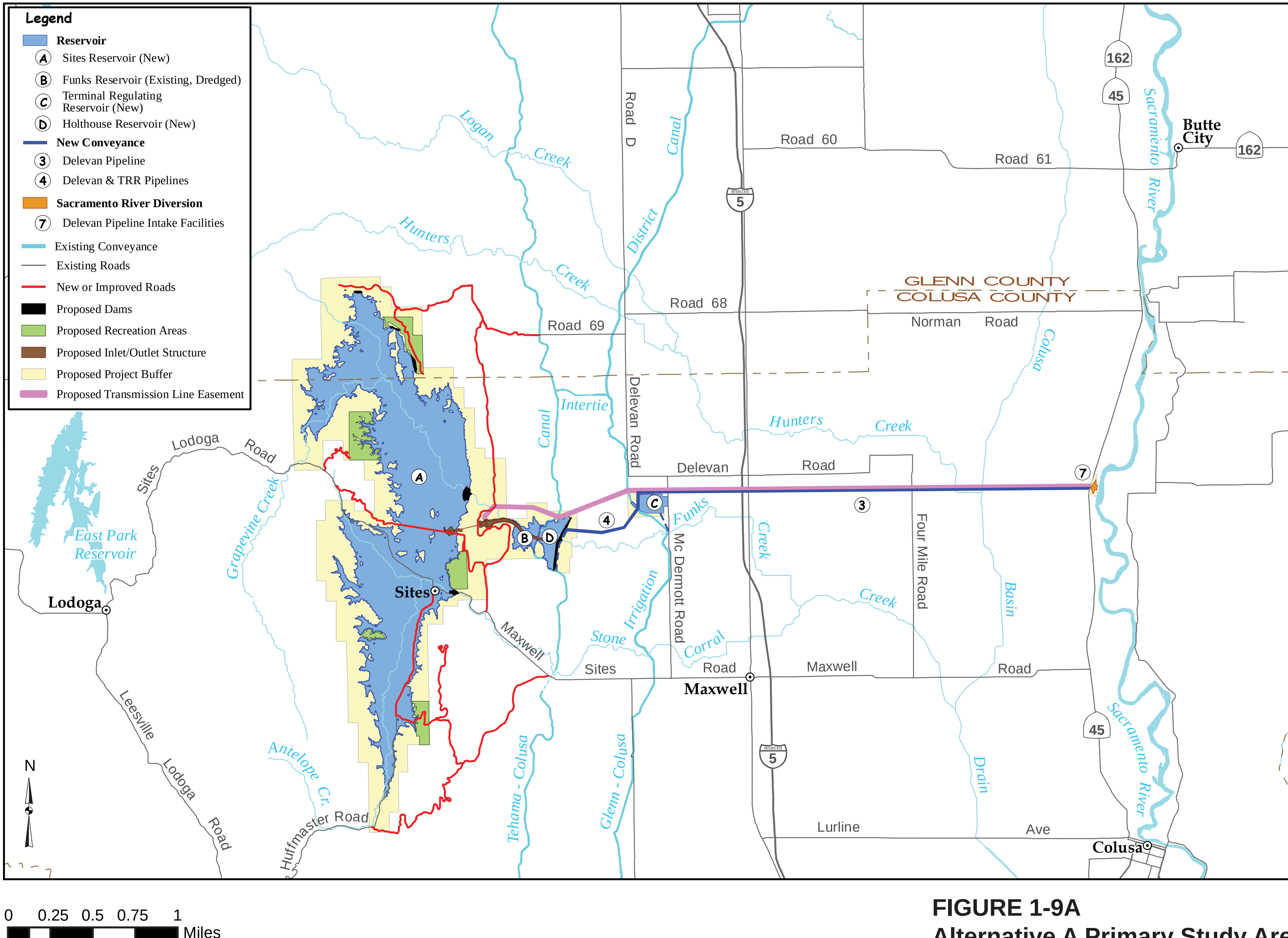

FIGURE 1-9A
Alternative A Primary Study Area
North-of-the-Delta Offstream Storage Project

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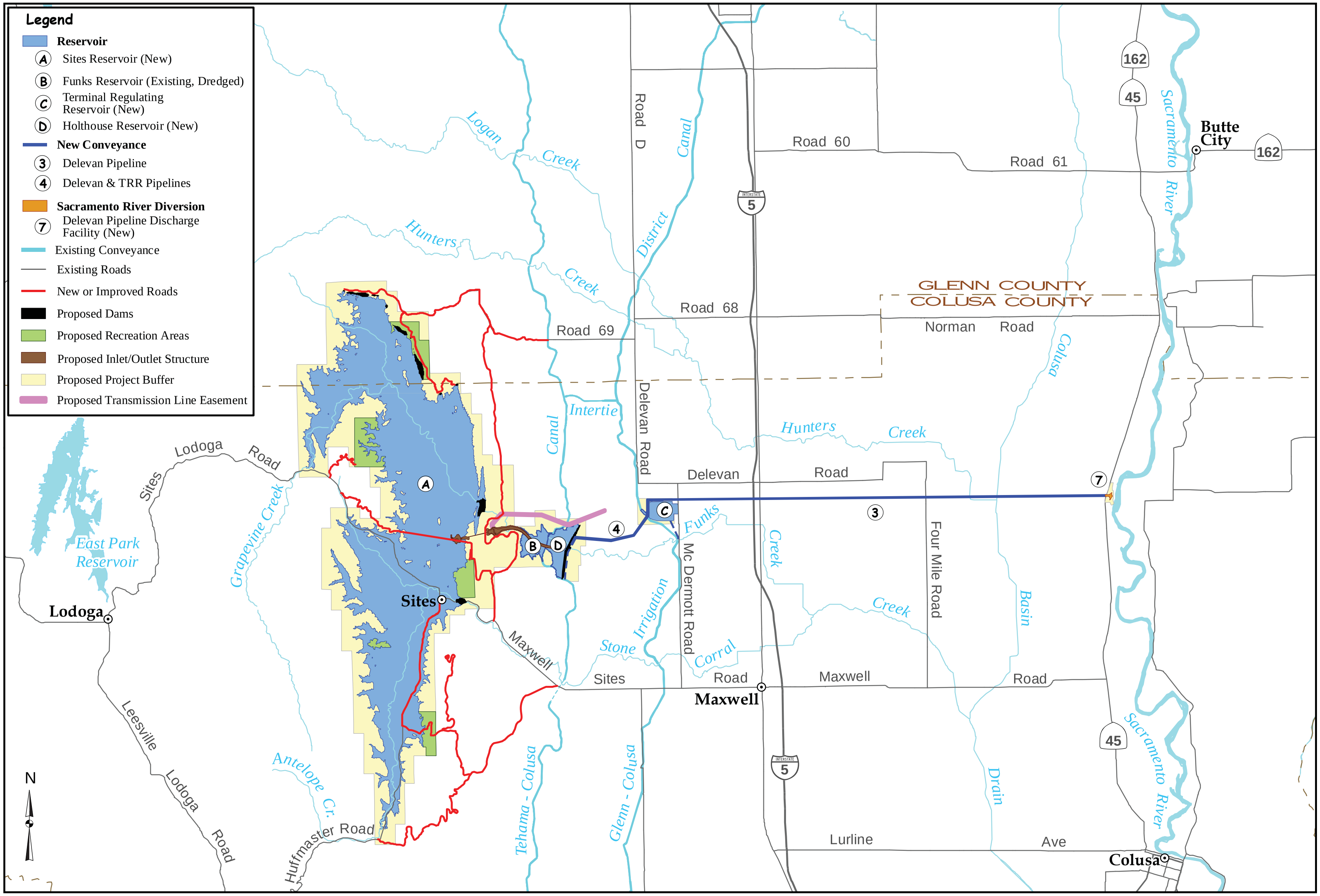

FIGURE 1-9B
Alternative B Primary Study Area
North-of-the-Delta Offstream Storage Project

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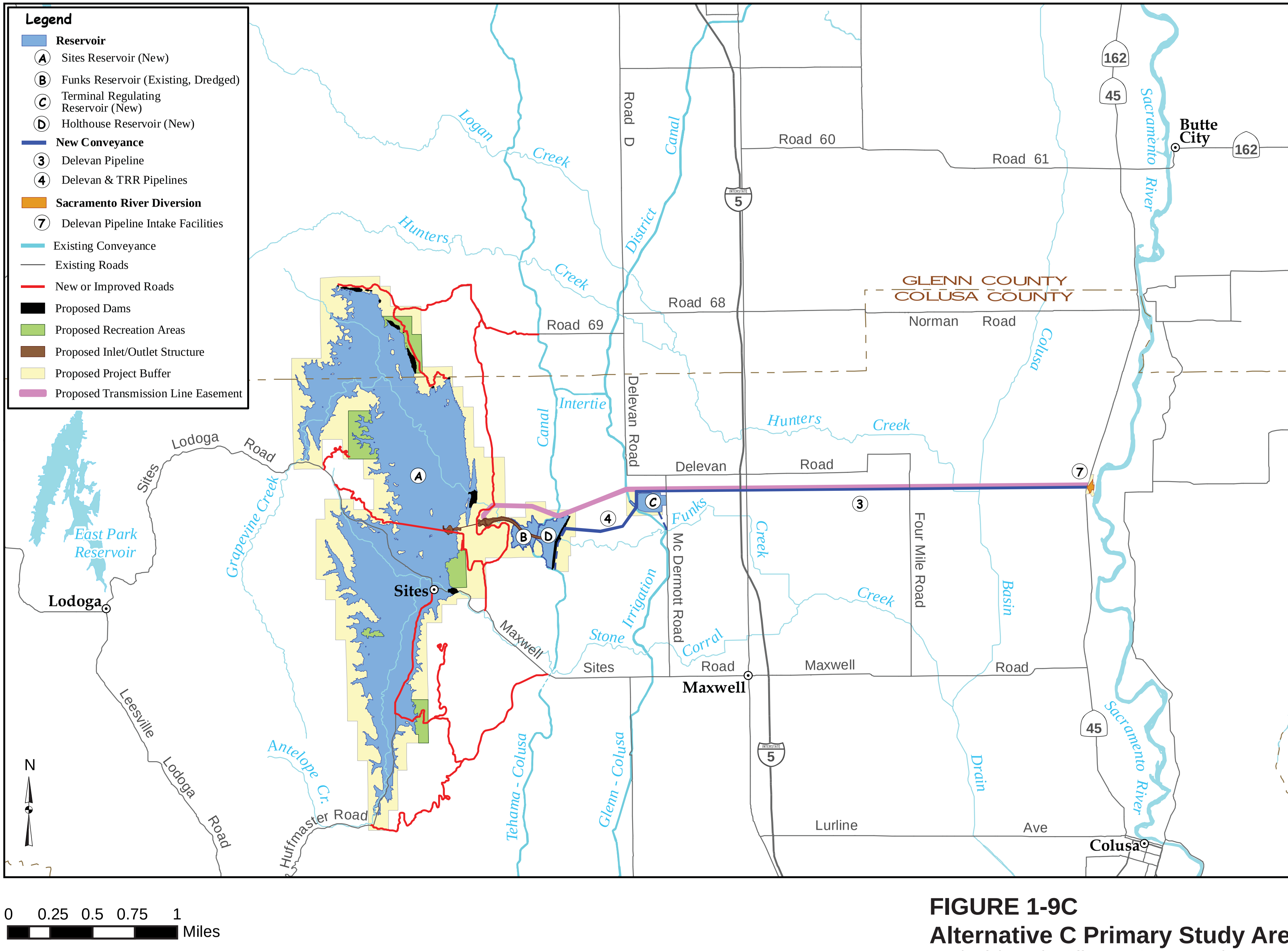

FIGURE 1-9C
Alternative C Primary Study Area
North-of-the-Delta Offstream Storage Project

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2. Alternatives Analysis

2.1 Introduction

CEQA Guidelines Section 15126.6 requires that an EIR describe and evaluate a reasonable range of alternatives that would feasibly meet most of the basic project objectives but would avoid or substantially lessen significant Project impacts. CEQA also requires that an EIR evaluate the “No Project” alternative along with its impacts. An EIR need only examine in detail alternatives that the lead agency determines could feasibly attain most of the objectives of the project and would avoid or substantially lessen at least one of the significant environmental effects of the project.

The National Environmental Policy Act’s (NEPA’s) implementing regulations are administered by the Council on Environmental Quality (CEQ) (40 CFR 1500 et seq.). Section 1502.14 of the CEQ Regulations for Implementing NEPA requires that an EIS rigorously explore and objectively evaluate all reasonable alternatives to the project, including a No Action Alternative and reasonable alternatives not within the jurisdiction of the lead agency. Additionally, NEPA requires that an EIS devote substantial treatment to each alternative considered in detail, including the proposed action, so that reviewers may evaluate their comparative merits.

This chapter summarizes the alternatives development process and alternatives analysis for the NODOS Project. A more detailed description of this comprehensive and iterative process is included in the NODOS Project Feasibility Report.

The proposed Project is defined as north-of-the-Delta offstream storage that should achieve, as much as possible, the following objectives: 1) Improve water supply reliability for agricultural, urban, and environmental uses, 2) Increase survival of anadromous and endemic fish populations, 3) Improve environmental and drinking water quality in the Delta, 4) Provide flexible hydropower generation to support integration of renewable energy sources, 5) Develop additional recreation opportunities, and 6) Provide incremental flood damage reduction opportunities.

2.2 Approach to Alternatives Analysis

2.2.1 Overview of the Alternatives Analysis

The NODOS Project alternatives analysis was completed in phases. The study of the NODOS Project was originally derived from the CALFED Bay-Delta Program’s (CALFED Program) identification of a range of activities that, if implemented, could concurrently improve the quality and reliability of California’s water supplies as well as ecosystem conditions and levee integrity in the Sacramento-San Joaquin Delta. Among many recommended activities, the CALFED Program identified the need for an additional 3.0-MAF of storage north of the Delta to meet environmental and water supply needs. The CALFED Program also expressed a preference for offstream over onstream storage to avoid redirected impacts to fisheries and other aquatic species. The CALFED Program initially identified 52 potential surface storage locations[1] but retained only 12 reservoir locations statewide for further study (CALFED, 2000). For a

[1]The results of this inventory are presented in the March 7, 1997 draft report, *CALFED Bay-Delta Program Storage and Conveyance Component Inventories* (CALFED, 1997). The inventory includes 51 potential surface water storage sites. Subsequently, the August 2000 *CALFED Initial Surface Water Storage Screening Report* added the San Luis Enlargement to the list of potential sites.

summary of the CALFED Program Inventory of Potential Surface Water Storage Sites, refer to Appendix 2A. Red Bank, Newville, Colusa, and Sites are four (of the 12) reservoir locations that are offstream and located north of the Delta. Consistent with these recommendations, DWR initiated studies of the four north-of-the-Delta offstream storage alternatives in 1997.

The consideration and evaluation of these four alternatives is described below. DWR and Reclamation eliminated the Red Bank and Colusa alternatives based upon a comparison of environmental effects and feasibility considerations, which are documented in the 2000 NODOS Investigation Progress Report and in the 2006 NODOS Initial Alternatives Information Report. This allowed DWR and Reclamation to compare and evaluate the No Project/No Action Alternative, the Newville Reservoir Alternative, and the Sites Reservoir Alternative in greater detail, consistent with NEPA and CEQA requirements. Based on the detailed evaluation of these alternatives, the Sites Reservoir Alternative was selected as the preferred proposed project alternative.

DWR and Reclamation have also completed a more detailed evaluation of effects, consistent with CEQA and NEPA requirements, of three configurations of Sites Reservoir, hereafter called Alternative A, Alternative B, and Alternative C. The results and conclusions of these evaluations are found in Chapters 6 through 35. For purposes of CEQA, these alternatives should be considered as three variations of the Sites Reservoir Alternative (i.e. the preferred Project alternative). For NEPA purposes, Alternative A, Alternative B, Alternative C, and the No Project/No Action Alternative were evaluated in detail in accordance with the Council on Environmental Quality regulation 1502.14b.

2.2.2 Alternatives Considered

The four north-of-the-Delta offstream storage reservoir alternatives are described below and are shown on Figure 2-1:

- **Red Bank Alternative:** The Red Bank Alternative would be located approximately 17 miles west of the City of Red Bluff in Tehama County. This project would be comprised of a 104-TAF Dippingvat Reservoir on South Fork Cottonwood Creek, and a 250-TAF Schoenfield Reservoir on Red Bank Creek. The primary source of water would be from South Fork Cottonwood Creek, with water diverted from Dippingvat Reservoir to Schoenfield Reservoir. Two small dams and reservoirs, Lanyan and Bluedoor, would be located on small tributaries of Red Bank Creek and would be part of the conveyance from Dippingvat to Schoenfield. Dippingvat Reservoir would be an onstream storage facility used for short-term storage and diversion; Schoenfield is considered to be an offstream storage facility. This alternative location was designed to allow water stored in Schoenfield Reservoir to be released down Red Bank Creek directly into the Tehama-Colusa Canal intake. The Red Bank Alternative was conceived to provide an alternative water supply to the Tehama-Colusa Canal which would not require operation of the Red Bluff Diversion Dam (RBDD) during critical fish passage periods (estimated to be approximately two months per year).
- **Newville Reservoir Alternative:** The Newville Reservoir Alternative would be located upstream from Black Butte Reservoir, approximately 18 miles west of the City of Orland and 23 miles west-southwest of the City of Corning in Glenn and Tehama counties. Alternative reservoir sizes of 1.9-MAF and 3.0-MAF were considered. The 1.9-MAF reservoir would be formed by a dam on North Fork Stony Creek and a saddle dam at Burrows Gap. The 3.0-MAF reservoir would require up to five additional saddle dams and a dike. A small diversion dam and diversion from Thomes Creek would transfer water to the reservoir. Other water source options include Stony Creek and the Sacramento

River. Multiple conveyance options would be possible using existing infrastructure (e.g., canals), new infrastructure (e.g., canals, tunnels, and/or pipelines), or a combination of new and existing facilities.

- **Sites Reservoir Alternative:** The Sites Reservoir Alternative, which would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell in Glenn and Colusa counties, would be formed by constructing two major dams on Stone Corral Creek and Funks Creek. Evaluation of the Sites Reservoir Alternative focused on a 1.8-MAF reservoir that would also require the construction of nine saddle dams along the southern edge of the Hunters Creek watershed. Diversions from the Colusa Basin Drain (CBD), the Sacramento River, and local tributaries could provide potential sources of water supply for Sites Reservoir. Multiple conveyance options would be possible, with 13 optional conveyance systems (using existing and new conveyance infrastructure) from the Sacramento River, two from CBD, and two from Stony Creek.

- **Colusa Reservoir Alternative:** The Colusa Reservoir Alternative would be located in north-central Colusa County and south-central Glenn County, approximately 12 miles southwest of the community of Willows and 10 miles west of Maxwell. The Colusa Reservoir Alternative, a 3.0-MAF storage project, would include the area inundated by the 1.8-MAF Sites Reservoir (described above) plus the adjacent Logan Creek and Hunters Creek watersheds to the north (known as the Colusa Cell). The Colusa Cell would require four major dams along Logan Ridge in addition to those described for Sites Reservoir: one for Logan Creek and three for Hunters Creek and its tributaries. The Colusa Cell would add up to 67 percent greater storage capacity to Sites Reservoir. Water source and conveyance options for diversion and delivery to offstream storage would be similar to those for Sites Reservoir. Diversions from the Colusa Basin Drain (CBD), the Sacramento River, and local tributaries would provide potential sources of water supply for the Colusa Reservoir Alternative. Multiple conveyance options would be possible using existing infrastructure (e.g., canals), new infrastructure (e.g., canals, tunnels, and/or pipelines), or a combination of new and existing infrastructure.

Previous studies, going back as far as the 1940s, were conducted at each of the four reservoir alternative locations. Data gathered during the NODOS Investigation was used to supplement those studies to allow for comparative evaluation of the alternatives. During the NODOS Investigation, geology, geotechnical, and engineering studies were conducted. Wetland delineations and cultural resources surveys were also conducted, as well as studies of the following environmental resources: vernal pool species, rare plants, plant communities, valley elderberry longhorn beetles, mammals, birds, fish, amphibians, and reptiles. Studies were conducted at similar levels of effort for each reservoir alternative and focused primarily on the reservoir footprints. The results of these studies were summarized in the July 2000 *North of the Delta Offstream Storage Investigation Progress Report* (DWR 2000). Environmental resources data collected for the four reservoir alternatives for the 2000 Progress Report are summarized in Tables 2-1 through 2-9.

Table 2-1
Jurisdictional Wetlands and Waters of the U.S. Delineation within the Four Potential Reservoir Locations

Wetlands Type	Acreage by Reservoir Location			
	Sites	Colusa*	Newville	Red Bank
Alkaline	19	35	3	0
Emergent	2	0	6	included with seasonal
Riparian	22	11	77	76
Seasonal	153	263	304	7

Table 2-1
Jurisdictional Wetlands and Waters of the U.S. Delineation within the Four Potential Reservoir Locations

Wetlands Type	Acreage by Reservoir Location			
	Sites	Colusa*	Newville	Red Bank
Total Jurisdictional Wetlands	196	309	390	83
Streams	159	111	165	118
Ponds	16	24	66	34
Other Waters	175	135	231	152
Total Waters of U.S.	371	444	621	235
Reservoir Area	14,162	13,664	17,073	4,905

*Colusa Reservoir would include the footprint of Sites Reservoir. Total acreage reported for Colusa Reservoir reflects data from the Colusa Cell only; these totals would therefore be in addition to the total acreage reported for Sites Reservoir.

Table 2-2
Total Acreage of Potential Special-Status Shrimp Species Habitat within the Four Potential Reservoir Locations

Reservoir Location	Total Extent of Potential Special-Status Shrimp Species Habitat (Acres)		
	1998 Survey	1999 Survey	Difference
Red Bank	0.0	0.0	0.0
Newville	26	26	0
Sites	73	71	-2
Colusa*	12	12	0

*Colusa Reservoir would include the footprint of Sites Reservoir. Total acreage reported for Colusa Reservoir reflects data from the Colusa Cell only; these totals would therefore be in addition to the total acreage reported for Sites Reservoir.

Table 2-3
Acreage Estimates of the Dominant Vegetation Communities Mapped within the Four Potential Reservoir Locations

Vegetation Community	Acreage By Reservoir Location			
	Sites	Colusa[a]	Newville	Red Bank
Grassland	12,602	13,540	14,492	565
Woodland (oak)	923	20	1,839	899
Woodland (foothill pine)	0	0	0	2,826
Chaparral	5	0	363	98
Riparian	52	37	64	73
Vegetated wetland	23	15	0	1
Cultivated grain	277	0	0	0
Vegetation Subtotal	**13,882**	**13,612**	**16,758**	**4,462**
Other[b]	280	51	315	142
Total Reservoir Acreage	**14,162**	**13,663**	**17,073**	**4,604**

[a]Colusa Reservoir would include the footprint of Sites Reservoir. Total acreage reported for Colusa Reservoir reflects data from the Colusa Cell only; these totals would therefore be in addition to the total acreage reported for Sites Reservoir.

[b]Other classification refers to disturbed/developed acreage within the inundation elevations.

Table 2-4
State-Listed, Federally-Listed, and Special Concern Avian Species Which May Occur at the Four Potential Reservoir Locations

Species	Status[a]	Reservoir Location			
		Sites	Colusa[b]	Newville	Red Bank
Aleutian Canada Goose	FT				
American bittern	MNBMC				
American white pelican	CSSC				
Bank swallow	ST		X		
Barrow's goldeneye	CSSC				
Bell's sage sparrow	MNBMC				
Burrowing owl	CSSC, MNBMC	X	X	X	
California gull	CSSC	X			
California horned lark	CSSC, MNBMC	X	X	X	X
Common loon	CSSC, MNBMC				
Cooper's hawk	CSSC	X	X	X	X
Double-crested cormorant	CSSC		X		
Ferruginous hawk	CSSC, MNBMC	X			
Golden eagle	CSSC	X	X	X	X
Grasshopper sparrow	MNBMC		X		
Greater sandhill crane	ST		X		
Hermit warbler	MNBMC				
Lark sparrow	MNBMC	X	X	X	X
Lawrence's goldfinch	MNBMC		X		X
Least bittern	MNBMC				
Loggerhead shrike	CSSC, MNBMC	X	X	X	X
Long-billed curlew	CSSC, MNBMC	X	X	X	
Long-eared owl	CSSC	X	X	X	X
Merlin	CSSC	X		X	X
Mountain plover	CSSC, MNBMC				
Northern goshawk	CSSC, MNBMC				
Northern harrier	CSSC	X	X	X	X
Northern spotted owl	FE, SE				
Osprey	CSSC				X
Peregrine falcon	SE				
Prairie falcon	CSSC	X	X	X	X
Purple martin	CSSC				
Sharp-shinned hawk	CSSC	X	X		X
Short-eared owl	CSSC, MNBMC				
Southern bald eagle	SE, FT	X	X	X	X
Swainson's hawk	ST				
Tri-colored blackbird	CSSC, MNBMC	X	X	X	

PRELIMINARY – SUBJECT TO CHANGE

Table 2-4
State-Listed, Federally-Listed, and Special Concern Avian Species Which May Occur at the Four Potential Reservoir Locations

Species	Status[a]	Reservoir Location			
		Sites	Colusa[b]	Newville	Red Bank
Vaux's swift	CSSC, MNBMC				
Western snowy plover	CSSC, MNBMC				
Western yellow-billed cuckoo	SE, MNBMC				
White-faced ibis	CSSC, MNBMC				
White-faced kite	MNBMC	X			
Willow flycatcher	SE				
Yellow warbler	CSSC	X			
Yellow-breasted chat	CSSC				

[a]Listing status as of 2000 when initial surveys were completed.

[b]Colusa Reservoir would include the footprint of Sites Reservoir. Avian species reported for Colusa Reservoir reflect data from the Colusa Cell only; the total number of avian species that could occur within the Colusa Reservoir location would therefore be in addition to the species that could occur within the Sites Reservoir location.

Key:

CSSC = California Species of Special Concern
FE = Federal Endangered
FT = Federal Threatened
FPT = Federal Proposed Threatened
MNBMC = Migratory Nongame Birds of Management Concern (USFWS)
SE = State Endangered
ST = State Threatened
X = Observed at reservoir site indicated

Table 2-5
Sites Reservoir Avian Transect Results
(Density in Birds/Square Mile)

Species	Summer	Fall	Winter	Spring
Burrowing owl	0.24	0.05		
California horned lark	4.83	1.58	2.90	6.57
Cooper's hawk		0.03		0.06
Ferruginous hawk			0.12	
Golden eagle	0.23	0.20	0.26	0.32
Lark sparrow	NS	NS	0.47	1.46
Loggerhead shrike	0.93	1.60	1.17	0.47
Long-billed curlew			14.59	1.26
Northern harrier	0.05	0.50	1.53	0.58
Sharp-shinned hawk		0.40		0.03
Southern bald eagle			0.07	
Tri-colored blackbird				5.38
White-tailed kite	0.12			0.12
Miles of transect per season	37.5	88.0	75.0	150.5

Note:
NS = Not Sampled

Table 2-6
Colusa Reservoir Avian Transect Results*
(Density in Birds/Square Mile)

Species	Summer	Fall	Winter	Spring
Bank swallow		0.14		
Burrowing owl		0.14		0.03
California horned lark	85.00	7.38	22.63	36.66
Cooper's hawk		0.14	0.27	
Double-crested cormorant				0.10
Golden eagle	0.22	0.32	0.24	0.30
Lark sparrow	NS	NS		0.80
Loggerhead shrike	0.89	2.15	1.84	2.82
Long-billed curlew				4.53
Northern harrier	1.00	0.67	0.87	0.50
Prairie falcon		0.14		
Sandhill crane		0.67		
Sharp-shinned hawk		0.14		
Southern bald eagle		0.04	0.03	0.10
Tri-colored blackbird	41.50			20.32
Miles of transect per season	20.0	74.5	38.0	87.5

*Colusa Reservoir would include the footprint of Sites Reservoir. Observed avian species reported for Colusa Reservoir reflect data from the Colusa Cell only; the total number of species observed would therefore be in addition to the observed species reported for Sites Reservoir

Note:
NS = Not Sampled

Table 2-7
Newville Reservoir Avian Transect Results
(Density in Birds/Square Mile)

Species	Summer	Fall	Winter	Spring
California horned lark	NS	NS	0.52	0.75
Cooper's hawk	NS	NS	0.17	
Golden eagle	NS	NS	0.10	0.13
Lark sparrow	NS	NS	7.64	1.50
Loggerhead shrike	NS	NS	2.05	0.90
Merlin	NS	NS	0.04	
Northern harrier	NS	NS	0.15	0.06
Prairie falcon	NS	NS	0.05	0.12
Southern bald eagle	NS	NS	0.08	
Tri-colored blackbird	NS	NS	0.69	2.41
Miles of transect per season			58.5	58.5

NS=Not Sampled

Table 2-8
Red Bank Project Avian Transect Results
(Density in Birds/Square Mile)

Species	Summer	Fall	Winter	Spring
Cooper's hawk		0.07	0.16	0.26
Garden eagle	0.09	0.25	0.30	0.32
Lark sparrow	NS	NS	0.18	4.79
Lawrence's goldfinch			0.36	0.78
Merlin				0.07
Northern harrier		0.08	1.07	0.26
Osprey				0.13
Prairie falcon			0.0	0.13
Sharp-shinned hawk		0.19	0.40	0.06
Southern bald eagle		0.11	0.05	0.26
Miles of transect per season	25.5	53.0	55.0	68.0

NS = Not Sampled

Table 2-9
Sensitive Mammals Observed within the Four Potential Reservoir Locations

Species	Sites	Colusa*	Newville	RedBank
American badger	X	X	X	
Pallid bat	X	X	X	X
Ringtail	X		X	
San Joaquin pocket mouse			X	
Western red bat	X			X
Yuma myotis	X		X	X

*Colusa Reservoir would include the footprint of Sites Reservoir. Observed mammal species reported for Colusa Reservoir reflect data from the Colusa Cell only; the total number of species observed would therefore be in addition to the observed species reported for Sites Reservoir.

2.2.3 Alternatives Considered but Rejected from Further Consideration

Following an evaluation of the results of the NODOS Investigation Progress Report (DWR, 2000), the Red Bank and Colusa alternatives were eliminated from further consideration. The reasons for eliminating these two alternatives are provided below.

2.2.3.1 Red Bank Alternative

The following issues contributed to the decision to eliminate the Red Bank Alternative from further consideration:

- Because the primary storage for the Red Bank Alternative (Schoenfield Reservoir) would be offstream, the Red Bank Alternative was initially retained. However, the supply source (Dippingvat Reservoir) would be onstream, which would result in greater environmental impacts and implementation challenges. If Dippingvat Reservoir was removed from the alternative, another water supply source would be needed to fill Schoenfield Reservoir, and the storage volume of the Red Bank Alternative would be reduced to 0.25-MAF. This reduced storage volume would reduce the alternative's ability to provide broad benefits (when compared to the other location alternatives considered). In addition to the small storage capacity, initial geotechnical investigations indicated the potential for excessive reservoir leakage.

- The Red Bank Alternative location has greater habitat diversity than the other locations considered. More than 60 percent of the Red Bank Alternative location consists of blue oak-foothill pine habitat and approximately 20 percent consists of blue oak woodland habitat. In comparison, approximately 99, 85, and 89 percent of the Colusa, Newville, and Sites reservoir alternative locations, respectively, are dominated by annual grassland habitat. Consequently, the Red Bank Alternative site is able to support numerous wildlife species, and supports a relatively high winter deer use compared to the other locations.
- Cottonwood Creek is the largest undammed tributary in the upper Sacramento River Basin and is the most important source of sediments to the Sacramento River. These sediments are necessary for river meander, riparian recruitment, and spawning habitat. The Red Bank Alternative would substantially reduce sediment contributions to the Sacramento River.
- The South Fork of Cottonwood Creek also provides spawning habitat for fall-run and late-fall-run Chinook salmon, and supports spring-run Chinook salmon in some years. In addition to these potential fishery impacts, the California red-legged frog, federally listed as threatened, was observed during field surveys. As evaluated, this alternative would result in significant and unavoidable adverse effects to spring-run Chinook salmon and steelhead on the South Fork Cottonwood Creek.

Because of the potential for greater environmental impacts, the Red Bank Alternative was not recommended for further consideration. In addition, the conceptual purpose of the Red Bank Alternative was to supply the Corning and T-C canals early in the irrigation season, which would allow the RBDD gates to be raised an additional month or more. Subsequent to the elimination of the Red Bank Alternative from further consideration, NMFS released a Biological Opinion (2000) that requires phasing out the use of the RBDD gates. Construction of the Red Bluff Diversion Dam Fish Passage Improvement Project, which allows the RBDD gates to remain open permanently, was completed in September 2012. This new infrastructure and required operational change makes the proposed Red Bank Alternative obsolete.

2.2.3.2 Colusa Reservoir Alternative

The following issues contributed to the decision to eliminate the Colusa Reservoir Alternative from further consideration:

- The Colusa Reservoir Alternative surface area (28,000 acres) would be two times larger than the surface area of the Sites Reservoir Alternative (14,000 acres). Colusa's larger reservoir footprint (1.9 times the 1.9-MAF (14,500 acres) and 1.6 times the 3.0-MAF (7,000 acres) Newville Reservoir options), and its larger facilities would have an overall greater environmental impact than the other smaller reservoir alternatives.
- The potential reservoir size of the Colusa, Newville, and Sites alternatives were compared with respect to their capital construction cost for reservoir storage, yield, and unit cost of storage per deliverable Project yield. This comparison helped identify, on an annualized basis, the relative cost-effectiveness of each measure. The total capital storage cost (in 2004 dollars) for Sites Reservoir (1.8-MAF) was estimated at $320,250,000; Colusa Reservoir (3.0-MAF) at $1,411,520,000; and Newville Reservoir (1.9-MAF) at $235,134,000. Colusa Reservoir's high total capital storage cost (4.4 to 6.0 times the cost of the Newville and Sites reservoir alternatives respectively) made the Colusa Reservoir Alternative the least cost effective alternative.
- A preliminary economic assessment was conducted to compare the average annual cost of storage per yield for the three reservoirs. The estimated average annual cost per yield would be similar in

magnitude for the Sites Reservoir Alternative ($64 per acre-feet) and the Newville Reservoir Alternative ($47 per acre-feet), but would be comparatively excessive for the Colusa Reservoir Alternative ($235 per acre-feet). The Sites Reservoir Alternative's average annual cost for storage per unit yield would be approximately 36 percent greater than the Newville Reservoir Alternative. The Colusa Reservoir Alternative's average annual cost for storage per unit yield would be approximately 367 percent greater than the Sites Reservoir Alternative and approximately 500 percent greater than Newville Reservoir Alternative, while the increase in yield between the Colusa Reservoir Alternative and the Sites and Newville reservoir alternatives would only be approximately 19 percent.

All of the environmental and cultural resources effects of the Colusa Reservoir Alternative would be additive to those of the Sites Reservoir Alternative, as the Colusa Reservoir Alternative includes the entire reservoir footprint of the Sites Reservoir Alternative. These potential environmental effects would include substantial additional loss of wildlife habitat (13,664 acres) and impacts to wetlands and waters of the U.S., including an additional loss of 444 acres of waters of the U.S. above those identified for the 1.8 MAF Sites Reservoir Alternative. All other environmental effects would be additive to those of the 1.8 MAF Sites Reservoir Alternative. The Colusa Reservoir Alternative was determined to be infeasible due to cost, and undesirable based on substantially greater environmental effects as compared to either the Sites or Newville reservoir alternatives. Additionally, comparatively the Colusa Reservoir Alternative would fail to substantially lessen any significant effects. Because of this comparative lack of efficiency and greater environmental impact, the Colusa Reservoir Alternative was not recommended for further consideration.

2.3 Alternatives Selected for Analysis

The Sites and Newville reservoir alternatives were retained for further consideration. In addition, a No Project Alternative and No Action Alternative were added for consideration.

2.3.1 Background

DWR and Reclamation retained both the Sites and Newville reservoir alternatives for further analysis, as both alternatives were considered technically feasible and not enough data had been gathered to provide a meaningful comparison between the two alternatives. The NODOS Investigation continued engineering, geologic, environmental, and cultural resource data collection on the reservoir footprints. Additionally, these evaluations were expanded to include other major project facilities including diversions, conveyance routes, road relocations, recreation areas, and regulating reservoirs for both the Sites and Newville reservoir alternatives. These data allowed a more complete and robust comparison of the environmental effects of the two alternatives. DWR's November 5, 2001 Notice of Preparation (NOP) and Reclamation's November 9, 2001 Notice of Intent (NOI) indicated that the No Project, No Action, Sites Reservoir, and Newville Reservoir alternatives would be analyzed in the NODOS Project EIR/EIS. Reclamation's NOI also allowed for the evaluation of other alternatives to meet NODOS Project objectives, including conjunctive use or Shasta Reservoir enlargement, either as stand-alone projects or in conjunction with other NODOS Project alternatives.

Subsequent evaluations by other programs determined that the potential for conjunctive use is limited because Sacramento Valley groundwater basins recharge annually, leaving no space for operable storage (NHI and GCID 2011; URS 2007). Conjunctive use was, therefore, not retained as a feasible alternative.

Reclamation is investigating Shasta Lake enlargement as part of its Shasta Lake Water Resources Investigation. State involvement in this project is effectively barred by Public Resources Code section 5093.542, which authorizes DWR to participate in studies involving the technical and economic feasibility of enlargement of Shasta Dam but otherwise prohibits DWR or any State department or agency to assist or cooperate with any other entity on a project "…that could have an adverse effect on the free-flowing condition of the McCloud River, or on its wild trout fishery." As a result, Shasta Lake enlargement was not retained as a feasible alternative to meet NODOS Project objectives. Along with the No Project/No Action alternative, the Sites and Newville reservoir alternatives were retained for further analysis.

The alternatives were evaluated based on their ability to meet the following NODOS Project primary and secondary objectives (Table 2-10).

Table 2-10
North-of-the-Delta Offstream Storage Project Primary and Secondary Planning Objectives*

Primary Objectives	Secondary Objectives
Improve water supply reliability for agricultural, urban, and environmental uses.	Develop additional recreation opportunities in the study area
Improve environmental and drinking water quality in the Delta.	Provide incremental flood damage reduction opportunities
Increase survival of anadromous fish populations, as well as the health and survivability of other aquatic species	
Provide flexible hydropower generation to support integration of renewable energy sources	

*Primary planning objectives are the first priority that Project alternatives must address; Secondary planning objectives are opportunities that should be considered, to the extent possible, while meeting the Primary objectives.

Source: DWR and Reclamation, 2008.

The alternatives retained for further analysis are described below.

2.3.2 No Project/No Action Alternative

Existing Conditions, the No Project Alternative, and the No Action Alternative are described below to explain how the No Project/No Action Alternative was developed. The nature of the CEQA No Project Alternative and NEPA No Action Alternative are discussed briefly and separately below, but because the alternatives are, in this case, the same, all subsequent references will be to the No Project/No Action Alternative.

2.3.2.1 Existing Conditions

The CEQA Baseline for assessing significance of impacts of the proposed Project is the environmental setting, or Existing Conditions, at the time a NOP is issued, as provided for in CEQA Guidelines section 15125. However, the CEQA lead agency has the discretion, where appropriate, to fully or partially update baseline conditions beyond the time of the issuance of the NOP. The CEQA Baseline is developed to assess the significance of impacts of the proposed Project in relation to the actual environment upon which the proposed Project will operate. Generally, this environment is represented by conditions that exist at the time the NOP is issued. However, if the preparation of the EIR occurs over many years, it may be more relevant to expand the definition to include programs, projects, or policies that have been implemented during the preparation of the EIR.

The NOP for the proposed Project was published on November 5, 2001. However, because the preparation of this environmental document has occurred over many years, it was deemed necessary to update the baseline condition to June 2009 to include programs, projects, or policies that have been implemented during the document's preparation. Changes in the regulatory environment since November

2001 have fundamentally changed water management in California and necessitate updating the baseline conditions for environmental analyses in this DEIR/EIS. These changes include the issuance of new biological opinions (BO) by the U. S. Fish and Wildlife Service (USFWS) in December 2008 and the National Marine Fisheries Service (NMFS) in June 2009 on the operations of the State Water Project and Central Valley Project. Consequently, June 2009 (following the release of NMFS' BO) was selected as the proposed Project's Existing Conditions date.

2.3.2.2 No Project Alternative

CEQA requires an analysis of an alternative in which the proposed Project is not implemented. CEQA calls this scenario the No Project Alternative. The No Project Alternative allows decision-makers to use the EIR to compare the impacts of approving the proposed Project with the future conditions of not approving the proposed Project. Under CEQA, the No Project Alternative is the baseline for assessing the significance of impacts of the proposed Project (CEQA Guidelines section 15126.6 subsection (c) (1)). Analysis of the No Project Alternative proceeds along different lines depending upon the nature of the project. Where, as here, the project is a development project on identifiable property, the "no project" alternative is the circumstance under which the project does not proceed (CEQA Guidelines section 15126.6 subsection (e) (3)(B)). The No Project Alternative compares the environmental effects of the property remaining in its existing state against environmental effects which would occur if the project is approved.

CEQA Guidelines section 15126.6, subdivision (e)(2), indicates that No Project conditions include reasonably foreseeable changes in Existing Conditions and changes that would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.

Many of the reasonably foreseeable programs and projects included within the No Project Alternative will affect water supply, water quality, or anadromous fisheries. To clearly identify and separate the environmental effects of these reasonably foreseeable projects and programs included under the No Project Alternative, this DEIR/EIS includes analyses of both the Existing Conditions and the No Project Alternative compared to the proposed Project.

2.3.2.3 No Action Alternative

Similar to CEQA, NEPA also requires an analysis of an alternative in which the proposed Project is not implemented. The NEPA Baseline for assessing environmental effects, including cumulative effects, of the proposed Project and alternatives is defined as the No Action Alternative. The No Action Alternative also demonstrates the future consequences of not meeting the need of the proposed Project. The No Action Alternative generally focuses on programs, projects, or policies that would affect or be affected by the proposed Project or the alternatives. The No Action Alternative represents a projection of current conditions to reasonably foreseeable future conditions that could occur if the proposed Project or alternatives are not implemented. The No Action Alternative includes Existing Conditions and future actions that are authorized; approved through completion of NEPA, CEQA, and Endangered Species Act compliance processes; funded; and permitted.

The No Action Alternative assumptions are consistent with the requirements and limitations prescribed by CEQA; therefore, analysis of the No Action Alternative is the same as for the No Project Alternative, and the two are treated as one alternative in this document. The No Project/No Action Alternative assumptions include the assumptions related to the State Water Project (SWP) and Central Valley Project (CVP), ongoing programs and policies by governmental and nonprofit entities, and assumptions related to annual actions that vary every year. The No Project/No Action Alternative includes projects and programs with clearly defined management and/or operational plans, including facilities being constructed as of June 2009[2]. The No Project/No Action Alternative also includes projects and programs that received approvals and permits in 2009 to remain consistent with existing management direction. Those actions are consistent with the continuation of existing management direction or level of management for plans, policies, and operations by the lead agencies and other agencies. Table 2-11 provides a summary of SWP and CVP operations included in the No Project/No Action Alternative.

Table 2-11
Summary of SWP and CVP Operations Included in the No Project/No Action Alternative

Non-SWP and CVP Project: Water Rights: Pursuant to water rights and SWRCB Decision for Existing Facilities
Federal and State Refuges with Level 2 Water Supplies: Firm Level 2 water needs
Level 4 Refuge Supplies: Met through water acquisition by Reclamation
American River Demands: Water Rights: Full water rights CVP Contracts: Full contracts, including Freeport Regional Water Project
Operations of SWP Facilities: Existing Facilities with NMFS BO and USFWS BO conditions FERC License Renewal for Oroville Project South Bay Aqueduct Improvement and Enlargement Project
Operations of CVP Facilities: Existing Facilities with NMFS BO and USFWS BO conditions New Red Bluff Diversion Dam Fish Passage Improvement Facilities Interim implementation for San Joaquin River Restoration Plan Freeport Regional Water Project Delta Mendota Canal-California Aqueduct Intertie
Operations of non-CVP Facilities: City of Stockton Delta Water Supply Project Contra Costa Water District's Middle River Intake and Pump Station (previously known as the Alternative Intake Project) Contra Costa Fish Screen Project (Rock Slough) Los Vaqueros Reservoir Expansion to 160 TAF of total storage capacity (60 TAF increase in storage capacity over existing capacity of 100 TAF) Full implementation of Grasslands Bypass Project

Notes:
NMFS = National Marine Fisheries Service
TAF = thousand acre-feet
USFWS = U.S. Fish and Wildlife Service

The projects and programs that are included in the No Project/No Action Alternative are summarized in Table 2-12. For a more detailed description of each project or program included in the No Project/No Action Alternative, refer to Appendix 2B.

The No Project/No Action Alternative includes continued implementation of operations, maintenance, enforcement, and protection programs by federal, State, and local agencies and non-profit groups, as summarized in Table 2-13, and described in detail in Appendix 2C.

[2] The lead agencies have established June 2009 as the Existing Conditions date; it is characterized in Chapters 6 through 31 as the Environmental Setting/Affected Environment discussion.

Table 2-12
Projects and Programs Included in the No Project/No Action Alternative

Agency	Project/Program	Comments
California Department of Water Resources	Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	Completed in 2010.
Contra Costa Water District	Contra Costa Canal Fish Screen Project	Completed in late 2011.
Contra Costa Water District, Bureau of Reclamation, and California Department of Water Resources	Middle River Intake and Pump Station (previously known as the Alternative Intake Project)	Completed in July 2010.
California Department of Water Resources	Federal Energy Regulatory Commission License Renewal for Oroville Project	Final EIR in 2008. FERC license will be issued and operations will be in accordance with NMFS BO.
Freeport Regional Water Authority and U.S. Bureau of Reclamation	Freeport Regional Water Project	Completed in 2011.
Reclamation District 2093	Liberty Island Conservation Bank	Being implemented. Permits and approvals acquired in 2009.
City of Stockton	Delta Water Supply Project - Phase I	Completed in 2012.
U.S. Bureau of Reclamation and State Water Resources Control Board	Battle Creek Salmon and Steelhead Restoration Project	Construction started in 2009. Estimated completion in 2014.
Tehama Colusa Canal Authority and U.S. Bureau of Reclamation	Red Bluff Diversion Dam Fish Passage Improvement Project	Completed in September 2012.
U.S. Bureau of Reclamation, California Department of Fish and Wildlife, and Natomas Central Mutual Water Company	American Basin Fish Screen and Habitat Improvement Project	Estimated completion in 2014.
U.S. Bureau of Reclamation	Delta-Mendota Canal/California Aqueduct Intertie	Completed in April 2012.
U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, Sacramento Area Flood Control Agency, and Central Valley Flood Protection Board	Folsom Dam Safety and Flood Damage Reduction Project	Being constructed. Estimated completion in 2015.
Yolo County	General Plan Update	Adopted in November 2009.
Zone 7 Water Agency and California Department of Water Resources	South Bay Aqueduct Improvement and Enlargement Project	Completed in 2012.

Note:
BO = Biological Opinion
NMFS = National Marine Fisheries Service

Many ongoing programs include development of future projects that would require separate environmental documentation as well as continued operations, maintenance, and/or enforcement activities. The No Project/No Action Alternative does not include future projects that have not been specifically defined or do not have completed environmental documentation. It is recognized that it is the intent of the SWP and CVP to comply with the NMFS Operations BO and USFWS Operations BO, although the specific actions for new facilities have not been identified or evaluated at this time.

Table 2-13
Ongoing Programs Included in the No Project/No Action Alternative

Agency	Program
California Department of Boating and Waterways	Egeria Densa Control Programs
California Department of Boating and Waterways	Water Hyacinth Control Programs
California Department of Fish and Wildlife	Invasive Species Program
California Department of Fish and Wildlife	California Aquatic Invasive Species Management Plan
California Department of Fish and Wildlife	Zebra Mussel Rapid Watch Program and Response Plan for California
California Department of Fish and Wildlife	Fish Screen Passage Program
California Department of Fish and Wildlife	Delta-Bay Enhanced Enforcement Program
California Department of Fish and Wildlife	Ecosystem Restoration Program Conservation Strategy
California Department of Fish and Wildlife	Lower Sherman Island Wildlife Area Land Management Plan
California Department of Fish and Wildlife	Yolo Bypass Wildlife Area Land Management Plan
California Department of Fish and Wildlife and U.S. Fish and Wildlife Service	Hatchery and Stocking Program
California Department of Fish and Wildlife, California Department of Food and Agriculture, and California State Parks	Watercraft Inspection Programs
California Department of Water Resources	Delta Levees Flood Protection Program
California Department of Water Resources	Levee Repair-Levee Evaluation Program
California Department of Water Resources	Interagency Ecological Program
California Department of Water Resources	South Delta Temporary Barriers Program
California Department of Water Resources	Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project
California Department of Water Resources	Zebra Mussel Watch Program
California Department of Water Resources and California Department of Fish and Wildlife	Delta Fish Agreement (Four Pumps Project)
California Department of Water Resources and Yuba County Water Agency	Lower Yuba River Accord
California State Lands Commission	Marine Invasive Species Program
Central Valley Regional Water Quality Control Board	Cache Creek, Bear Creek, Sulfur Creek, Harley Gulch Mercury TMDL
Central Valley Regional Water Quality Control Board	Irrigated Lands Regulatory Program
California Partners in Flight	Riparian Habitat Joint Venture
Central Valley Joint Venture Program	Central Valley Joint Venture
Contra Costa County and East Contra Costa County Habitat Conservancy	East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan
Delta Protection Commission	Delta Protection Commission Land Use and Resource Management Plan Update
East Bay Municipal Utility District	Lower Mokelumne River Spawning Habitat Improvement Project
National Marine Fisheries Service, Bureau of Reclamation, and California Department of Water Resources	BO on the Long-Term Operations of the CVP and SWP (Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, Central Valley Steelhead, Southern Distinct Population Segment of North American Green Sturgeon, and Southern Resident Killer Whales)
Sacramento County	Sacramento International Airport Master Plan

Table 2-13
Ongoing Programs Included in the No Project/No Action Alternative

Agency	Program
Sacramento Area Flood Control Agency, Central Valley Flood Protection Board, and U.S. Army Corps of Engineers	Flood Management Program
Sacramento County, Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, and Rancho Cordova	Sacramento Stormwater Quality Partnership
San Francisco Bay Regional Water Quality Control Board	San Francisco Bay Mercury TMDL
San Joaquin Council of Governments	San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
San Joaquin County, Stockton, Tracy, and State Water Resources Control Board	San Joaquin County, Stockton, and Tracy Stormwater Management Programs
Bay Area Stormwater Management Association Agencies	Bay Area Stormwater Management Programs
U.S. Army Corps of Engineers	Delta Dredged Sediment Long-Term Management Strategy
U.S. Army Corps of Engineers	Suisun Bay Channel Operations and Maintenance
U.S. Army Corps of Engineers	Suisun Channel (Slough) Operation and Maintenance
U.S. Bureau of Reclamation and California Department of Water Resources	Water Year 2010 Interim Flows Project (San Joaquin River)
U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service	Anadromous Fish Screen Program
U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Water Resources, and Department of Fish and Wildlife	San Joaquin River Restoration Program
U.S. Coast Guard	Ballast Water Management Program
U.S. Fish and Wildlife Service	Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan
U.S. Fish and Wildlife Service	North American Waterfowl Management Plan
U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and California Department of Water Resources	BO on the Long-Term Operations of the CVP and SWP (Delta Smelt)
U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and California Department of Fish and Wildlife	San Joaquin Basin Action Plan
University of California, Davis and California Department of Water Resources	Smelt Hatchery Program
Yolo County	Yolo County Stormwater Management Program

Note:
BO = Biological Opinion

The following are other key assumptions for the No Project/No Action Alternative:

- The California Endangered Species Act (CESA) and the Federal Endangered Species Act (ESA) would continue to be implemented on a case-by-case basis for future programs and projects that have a potential to take listed species pursuant to each act.
- The No Project/No Action Alternative assumes settlement water rights holders in the Sacramento and San Joaquin river watersheds will use their full contract amounts by 2025 based on their contracts with Reclamation.
- The No Project/No Action Alternative assumes continued operations of flood management facilities by the federal, State, and local agencies. In addition, the No Project/No Action Alternative assumes that, without future engineering and environmental analyses, levee failures due to flooding, erosion,

subsidence, wave action, seismic events, burrowing animals, physical encroachment (such as barge collisions), or other causes would be repaired as part of ongoing programs. The No Project/No Action Alternative assumes that these repairs also would occur on privately owned levees that are integral to the main waterways in the Delta, such as repairs that occurred to privately owned levees following the 1996 and 1997 floods.

- The No Project/No Action Alternative also includes existing facilities for SWP, CVP, and Contra Costa Water District, and the Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal. Summary descriptions of these facilities are provided in Appendix 2D.
- Operations of the SWP and CVP by DWR and Reclamation, respectively, are described in the August 2008 Biological Assessment for the Long-term OCAP for the CVP and SWP prepared by Reclamation and modified by the 2009 NMFS BO and 2008 USFWS BO.
- SWP and CVP operational assumptions also include continued operations under the Coordinated Operations Agreement; SWRCB Decision 1641 (D-1641); use of Joint Points of Diversion (which allows DWR and Reclamation to use both the SWP and CVP diversion capacity capabilities in accordance with D-1641); SWRCB Water Quality Control Plan adopted in 2006; and implementation of the *Central Valley Project Improvement Act including environmental water actions in accordance with Section 3406(b)(2)*.
- The No Project/No Action Alternative assumes completion of the RBDD Fish Passage Improvement Project, and year-round gates out operations.
- The No Project/No Action Alternative does not assume new Delta conveyance facilities to be in place, rather Delta exports would continue to be pumped through the Banks and Jones pumping plants.
- The No Project/No Action Alternative does not include assumptions of future changes in facilities operations, land use, or policies to accommodate or mitigate the adverse impacts associated with climate change.
- The No Project/No Action Alternative does not include assumptions for climate change related to sea level rise and changes in precipitation patterns, including changes in ratios between snow and rainfall. A sensitivity analysis to account for climate change effects on the proposed Project was performed and is presented in Chapter 25 Climate Change and Greenhouse Gas Emissions.
- Population growth is expected to continue to occur in California throughout the period of project analysis (i.e., 100 years).

2.3.3 Sites Reservoir Alternative

The description of the Sites Reservoir Alternative was developed to include details for the appurtenant facilities shown in Figures 2-2 and 2-3. Evaluation of the alternative continued to focus on a 1.8-MAF reservoir size, although a range of reservoir sizes were also considered.

During this phase of the investigation, non-irrigation season flows in the CBD, the Sacramento River, and local tributaries remained potential sources of water supply for the offstream Sites Reservoir Alternative. Potential conveyance systems from these sources to the reservoir included existing and/or enlarged Tehama-Colusa (T-C) and Glenn-Colusa Irrigation District (GCID) canals, or a new conveyance facility from the Sacramento River near Moulton Weir and/or from the CBD to the existing Funks Reservoir on the T-C Canal. Conveyance from Stony Creek was also considered. All conveyance alternatives required enlargement of the existing Funks Reservoir to provide adequate storage capacity for pumping of water into the reservoir and hydropower generation. Major project facilities would be situated near the Funks Creek damsite, including outlet works, power plant, intake structure, and maintenance facilities. Additionally, up to five potential recreation facility locations were identified to meet the secondary objective of developing additional recreation opportunities in the study area.

Construction of Sites Reservoir would require relocation of two county roads (Sites Lodoga and Huffmaster roads) and the community of Sites.

2.3.4 Newville Reservoir Alternative

The description for the Newville Reservoir Alternative was also developed and refined to include details for the appurtenant facilities shown in Figures 2-4, 2-5, 2-6, and 2-7. Evaluation of the alternative focused on the 1.9-MAF reservoir size. A 3.0-MAF reservoir size was also considered and evaluated. However, all of the environmental and cultural resources effects, as well as the cost, of the 3.0- MAF reservoir would be additive to those of the 1.9-MAF reservoir. The 3.0-MAF Newville Reservoir was therefore not evaluated further.

The Sacramento River and existing Black Butte Reservoir were considered, in addition to Thomes Creek, as potential sources of water supply for the Newville Reservoir Alternative. Potential conveyance systems from these sources to the reservoir included the existing or enlarged T-C Canal with a new conveyance between the GCID and T-C canals, a new conveyance from the T-C Canal to the existing Black Butte Reservoir, and a new conveyance from Black Butte Reservoir to the Newville Reservoir Alternative. A new conveyance from a proposed Thomes Creek diversion at a location north and west of the Newville Reservoir Alternative was also considered. Additionally, five potential recreation areas were identified to meet the secondary objective of developing additional recreation opportunities in the study area.

Construction of the Newville Reservoir Alternative would require relocation of portions of three county roads, including Round Valley Road, Garland Road, and County Road 306.

2.4 Resource Impact Comparison for Selected Alternatives

A review of potential impacts to biological and cultural resources for the Sites Reservoir and Newville Reservoir alternatives indicated a greater impact potential for the Newville Reservoir Alternative. Potential impacts for both reservoir alternatives, as well as the No Project/No Action Alternative, are described below.

2.4.1 Cultural Resources

Table 2-14 presents a comparison of the cultural resources survey results for the Sites Reservoir (1.8-MAF) and Newville Reservoir (1.9-MAF) alternatives. Newville Reservoir Alternative data represent totals for the reservoir footprint only, while Sites Reservoir Alternative data include data associated with all major proposed Project facilities, including conveyance routes, road relocations, recreation areas, hydropower facilities, and a terminal regulating reservoir. Despite the smaller survey area, the Newville Reservoir Alternative location contains substantially more cultural resources than the Sites Reservoir Alternative location, including more middens. Middens are indicative of long periods of site occupation and are an important cultural resource, as they can be expected to yield substantial cultural information and human remains. Under the No Project/No Action Alternative, no impacts to cultural resources or cemeteries are expected.

Table 2-14
Comparison of Potential Cultural Resource Impacts associated with the Sites Reservoir and Newville Reservoir Alternatives

Cultural Resource	Number of Cultural Resources Identified	
	Sites Reservoir Alternative	Newville Reservoir Alternative*
Historic and prehistoric sites*	147	250
Cemeteries	2	2
Middens	57	80

*Newville Reservoir Alternative survey data for reservoir footprint only

2.4.2 Terrestrial Biological Resources

2.4.2.1 Wildlife Habitat

The Newville Reservoir Alternative could result in the permanent direct habitat loss of up to 24,866 acres, compared to 18,308 acres at the Sites Reservoir Alternative. The Newville Reservoir Alternative location also contains greater habitat and structural diversity, with the potential affected acreage of every habitat type greater for the Newville Reservoir Alternative than the Sites Reservoir Alternative(Table 2-15). Under the No Project/No Action Alternative, no permanent loss of most habitat types is expected to occur. Blue oak woodlands would likely continue to be lost due to ongoing fuelwood harvest at both reservoir alternative locations.

Table 2-15
Potential Permanent Habitat Loss Comparison between the Sites Reservoir and Newville Reservoir Alternatives

Habitat Type	Potential Permanent Habitat Loss (acres)*	
	Sites Reservoir Alternative	Newville Reservoir Alternative
Annual grassland	16,311	17,556
Blue oak woodland	924	2,532
Wetlands	249	525
Riparian	75	476
Chaparral	1	422
Agricultural	250	1,744
Valley oak woodland	4	104
Juniper woodland	0	36
Shale barren	0	268
Blue oak/foothill pine	494	1,203
Total acreage	18,308	24,886

*Acreage values include all project features including reservoirs, dams, road relocations, and conveyance routes where habitat would be permanently modified.

2.4.2.2 Wildlife Species

Several invertebrate species protected under the federal Endangered Species Act have the potential to occur at or near both the Sites Reservoir and Newville Reservoir alternatives locations, including valley elderberry longhorn beetle, vernal pool fairy shrimp, Conservancy fairy shrimp, and vernal pool tadpole shrimp.

Protocol-level surveys conducted at the Sites Reservoir Alternative location indicate that none of the federally-listed vernal pool invertebrates are present. Vernal pools at the Newville Reservoir Alternative location were not surveyed.

Protocol-level surveys indicate that nearly twice as many elderberry stems would be affected, and that the presence of the valley elderberry longhorn beetle is much higher (based on surveyed emergence holes), at the Newville Reservoir Alternative location than at the Sites Reservoir Alternative location (Table 2-16). Under the No Project/No Action Alternative, no significant loss of vernal pool habitat is expected. Continued long-term degradation related to disking for dryland grain production will likely continue at the Sites Reservoir Alternative location. No significant additional loss of elderberry shrubs at either reservoir alternative is expected under the No Project/No Action Alternative.

Table 2-16
Valley Elderberry Longhorn Beetle Survey Results Comparison between the Newville Reservoir and Sites Reservoir Alternatives

VELB* Survey Criteria	Number Observed per Location	
	Sites Reservoir Alternative	Newville Reservoir Alternative
Total elderberry stems	672	1201
Elderberry stems with emergence holes	18	264

*VELB = valley elderberry longhorn beetle

Comparison of Sites and Newville reservoir alternatives indicate that both locations have the potential for short-term construction-related impacts to the giant garter snake, which is State and federally listed as threatened. Under the No Project/No Action Alternative, no short-term or long-term impacts to giant garter snake are expected.

The California red-legged frog, federally listed as threatened, was found during field surveys in the vicinity of the Newville Reservoir Alternative location. This species was not found during field surveys at the Sites Reservoir Alternative location. No adverse effects to California red-legged frog are expected under the No Project/No Action Alternative.

Comparison of the Sites and Newville reservoir alternatives indicate comparable occurrence of, and potential impacts to, State and federally listed birds and mammals. Both reservoir alternative locations would result in take under the Bald and Golden Eagle Protection Act. No substantial take of State or federally listed birds or mammals are expected under the No Project/No Action Alternative. Some minor degradation of golden eagle nesting and foraging habitat will likely continue under the No Project/No Action Alternative due to ongoing fuelwood harvest and ground squirrel control activities at both reservoir alternative locations.

The Newville Reservoir Alternative would impact a portion of the Thomes Creek deer herd's winter range. The Sites Reservoir Alternative location does not include deer winter range. Under the No Project/No Action Alternative, degradation of deer wintering habitat at the Newville Reservoir Alternative location will likely continue due to fuelwood harvest of oaks.

2.4.3 Aquatic Biological Resources

The Newville Reservoir Alternative includes a diversion on Thomes Creek. This diversion is included as a project component (even though it is onstream) because it can provide approximately 200-TAF per year of additional water to storage by gravity (without requiring pumping). Subsequent engineering evaluation indicated substantial design difficulties in providing a suitable diversion which can pass both fish and sediment at this location. This diversion would result in substantial adverse effects to spring-run Chinook salmon, steelhead, and sediment passage. Without feasible fish passage measures, adverse effects to anadromous fisheries would occur. These adverse effects would not be consistent with the NODOS Project primary planning objective of increased survival of anadromous fish populations, or CALFED's direction to avoid significant redirected impacts including those associated with new onstream reservoirs. By comparison, the tributary streams that would be affected by the Sites Reservoir Alternative, which include Stone Corral and Funks creeks, are ephemeral and do not support anadromous fisheries.

Under the No Project/No Action Alternative, no changes to anadramous fish habitat or populations are expected at either reservoir alternative location. However, many programs and projects included under the No Project/No Action Alternative are designed specifically to improve fish habitat and increase fish populations in the Sacramento Valley and Delta, including the Red Bluff Diversion Dam Fish Passage Improvement Project, Battle Creek Salmon and Steelhead Restoration Project, Contra Costa Canal Fish Screen Project, American Basin Fish Screen and Habitat Improvement Project, the CDFW Fish Screen and Passage Program, Delta Fish Agreement, OCAP Biological Opinions, and the Lower Yuba River Accord.

2.4.4 Botanical Resources

Field studies indicate that the Newville Reservoir Alternative contains greater numbers of rare plant species, higher priority plant species, and greater numbers of rare plant populations than the Sites Reservoir Alternative (Table 2-17). No substantial impacts to rare plant populations are expected at either reservoir alternative location under the No Project/No Action Alternative. Continued minor degradation of some rare plant populations will likely occur due to land use practices such as dryland farming, year-round grazing, and herbicide use.

Table 2-17
Comparison of Rare Plant Species and Populations at the Sites and Newville Reservoir Alternatives

Listing Status	Number of Rare Plants Observed (species/populations)	
	Sites Reservoir Alternative	Newville Reservoir Alternative
State or federal threatened or endangered	0	0
State or federal species of concern	0	3/57
CNPS 1A	0	0
CNPS 1B	0	5/122
CNPS 2	0	0
CNPS 3	0	0
CNPS 4	4/37	7/183

Note:
CNPS=California Native Plant Society List

2.4.5 Wetlands and Waters of the U.S.

Comparison of the Newville and Sites reservoir alternatives indicates that the Newville Reservoir Alternative would impact significantly greater amounts of wetlands and waters of the U.S. (Table 2-18), including jurisdictional wetlands, than the Sites Reservoir Alternative. No substantial loss of wetlands or waters of the U.S. are expected at either reservoir alternative location under the No Project/No Action Alternative. Minor continued degradation of vernal pool habitats will likely continue due to disking for dryland grain farming.

Table 2-18
Comparison of Potential Impacts to Wetlands and Waters of the U.S. between the Sites and Newville Reservoir Alternatives.

Resource	Wetlands and Waters of the U.S. Potentially Impacted (acres)	
	Sites Reservoir Alternative	Newville Reservoir Alternative
Wetlands	196	390
Waters of the U.S.	175	231
Total wetlands and waters*	**371**	**621**

*Reservoir footprint data comparisons

2.4.6 Energy and Greenhouse Gas Emissions

The Newville Reservoir Alternative would require more energy for pumping than the Sites Reservoir Alternative because minimum conveyance distances would be greater (18 to 23 miles for Newville Reservoir, compared to one to 13 miles for Sites Reservoir), more pumping plants would be required, and higher pumping elevations (approximately 400 feet higher pumping elevation for Newville Reservoir) would be required for conveyance for Newville Reservoir Alternative. Higher conveyance-related energy requirements associated with the Newville Reservoir Alternative would result in relatively greater operational greenhouse gas emissions than for the Sites Reservoir Alternative. In addition, due to its greater embankment volume (35 million cubic yards for the Newville Reservoir Alternative vs. 22 million cubic yards for the Sites Reservoir Alternative), the Newville Reservoir Alternative would result in greater construction equipment hours and, therefore, greater GHG emissions during construction. Under the No Project/No Action Alternative, little change in the current levels of GHG emissions is expected because agricultural cultivation is the largest contributor of GHG emissions within the reservoir alternative locations, and the amount of land under cultivation at those locations is not expected to change.

2.4.7 Surface Water Resources

The Sites Reservoir Alternative would increase water supply reliability for agricultural, municipal, industrial, and environmental water users. The Newville Reservoir Alternative would increase water supply reliability for agricultural water users in the Sacramento Valley directly, and then potentially for other users by exchange. Elimination of the Thomes Creek Diversion for the Newville Reservoir Alternative due to its infeasibility would significantly increase the alternative’s construction costs, as other water sources 1) require much longer and more expensive conveyances, and 2) would have long-term greater operational costs, as they require pumpage instead of gravity to fill or refill the reservoir. Water supply reliability would be improved under the No Project/No Action Alternative with implementation of the many projects and programs included in the No Project/No Action Alternative, including South Bay Aqueduct Improvement and Enlargement Project, Freeport Regional Water Project, Delta Mendota Canal-California Aqueduct Intertie, City of Stockton Delta Water Supply Project, Contra Costa Water District’s Middle River Intake and Pump Station Project, and Los Vaqueros Reservoir Expansion. Water supply reliability is increasingly linked to conservation measures issued under the federal Endangered Species Act. Some fish restoration actions identified under the No Project/No Action

Alternative may serve to expedite species recovery and ultimately result in improved water supply reliability. Examples include the Red Bluff Diversion Dam Fish Passage Improvement Project, Battle Creek Salmon and Steelhead Restoration Project, Contra Costa Canal Fish Screen Project, American Basin Fish Screen and Habitat Improvement Project, the CDFW Fish Screen and Passage Program, Delta Fish Agreement, OCAP Biological Opinions, and the Lower Yuba River Accord.

2.4.8 Flood Management

The Sites Reservoir Alternative could provide some local flood management benefits to lands that are currently prone to flooding during high flow events on Funks and Stone Corral creeks; the Newville Reservoir Alternative would have little flood management potential since the reservoir would be located upstream of Black Butte Reservoir, an existing flood management facility. Diversion facilities on Thomes Creek would have little or no ability to store water or provide downstream flood protection. Under the No Project/No Action Alternative, the Folsom Dam Safety and Flood Damage Reduction Project would improve flood protection for the Lower American River and the City of Sacramento.

2.4.9 Cost and Engineering Feasibility

Comparison of cost and engineering feasibility of the Sites and Newville reservoir alternatives indicate that both alternatives are technically feasible. However, construction and operational costs would be greater for the Newville Alternative due to greater embankment requirements, and greater conveyance length and lift. Costs and engineering feasibility associated with the No Project/No Action Alternative are not applicable.

2.4.10 Sites-Newville Impact Comparison Conclusion

Surveys indicated that the Sites Reservoir and Newville Reservoir Alternatives would have similar potential impacts to giant garter snakes, State- and federally-listed birds and mammals, and that both would result in take under the Bald and Golden Eagle Protection Act. However, surveys also indicated that the Newville Reservoir Alternative would have a much higher potential for adverse impacts to cultural resources, wildlife habitat and diversity, elderberry plants and the valley elderberry longhorn beetle, the red-legged frog, deer winter range, rare plants and plant populations, and anadromous fish.

In addition, the Newville Reservoir Alternative would be more expensive to construct and operate than the Sites Reservoir Alternative, and would result in relatively greater construction and operation-related greenhouse gas emissions.

2.5 Preferred Proposed Project Alternative

DWR and Reclamation selected the Sites Reservoir Alternative as the preferred proposed Project alternative to be retained for further study and more detailed evaluation because of the consistently higher potential for biological and cultural resources impacts associated with the Newville Reservoir Alternative, and because the Newville Reservoir Alternative would not avoid or reduce any of the significant adverse effects associated with the Sites Reservoir Alternative.

Once the Sites Reservoir Alternative was identified as the preferred proposed Project alternative (hereafter proposed Project), all other necessary proposed Project features were conceptually developed and refined, including analyses of reservoir storage size, conveyance, and operational alternatives to maximize achievement of the NODOS Project objectives.

2.5.1 Sites Reservoir Storage Size Alternatives

DWR and Reclamation considered various storage sizes of Sites Reservoir, including 800 TAF, 1.27 MAF, 1.81 MAF, and 2.1 MAF. These four storage sizes were selected to reflect a range of storage values that would allow for a useful comparison of the costs and benefits estimates. These four storage sizes also represent points on the cost curve where the proposed Project's costs would change significantly due to the need for new Project features, such as dams or embankments.

Table 2-19 presents a summary of each Sites Reservoir storage size that was initially considered, including the total number of dams that would be required to impound Sites Reservoir and the total embankment volume that would be required for each of the four storage sizes.

Table 2-19
Summary of Dams and Embankment Volume of Potential Sites Reservoir Storage Sizes

Reservoir Storage (MAF)	Maximum Water Surface Elevation (feet)	Reservoir Surface Area (acres)	Total Number of Dams[a] (main + saddle)	Total Embankment Volume (CY)
0.80	440	10,200	2 + 3	6,900,000
1.27	480	12,400	2 + 7	11,018,400
1.81	520	14,200	2 + 9	22,009,000
2.10	540	15,100	2 + 7[b]	33,800,000

[a]Total number of dams includes the Sites and Golden Gate dams and the saddle dams.
[b]Saddle dams 7, 8, and 9 become one continuous embankment for the 2.1-MAF reservoir.

Notes:
MAF = million acre-feet
CY = cubic yards

Source: DWR, 2004

Based on a review of the reservoir rim topography, site geology, and a cursory evaluation of the relationship between embankment volume and reservoir storage, DWR and Reclamation determined early in the investigation that a 2.1-MAF reservoir may present significant design challenges. Reservoir elevations at or above 540 feet elevation would likely require grouting of the lower saddle areas along the relatively steep ridges of the eastern rim to ensure the proposed Project would perform satisfactorily. This treatment, combined with the increasing relationship between embankment material volume and reservoir surface elevations, would result in larger unit costs (reservoir cost per acre-foot of storage) for reservoir elevations above 540 feet elevation. Therefore, the Sites Reservoir storage capacities below 540 feet elevation were considered to be more economical on a unit cost basis. Limiting the maximum reservoir elevation to 520 feet elevation would provide assurance that unknown conditions (such as leakage) on the relatively steeper slopes of the eastern reservoir rim would not result in large increases in proposed Project costs during the later stages of design. Therefore, a maximum reservoir elevation of 540 feet, corresponding to a reservoir size of 2.1 MAF, was eliminated from further consideration. Reservoir storage capacities of 800 TAF, 1.27 MAF, and 1.81 MAF were, therefore, carried forward for further consideration, including initial alternative development and evaluation.

2.5.2 Sites Reservoir Conveyance Alternatives

Preliminary operations simulations indicated that 3,000 to 6,000 cfs of total inflow capacity would be needed to reliably fill Sites Reservoir. Because Sites Reservoir would be located offstream, water would need to be diverted to and released from the reservoir. As a result, diversion and conveyance facilities would be needed to transport water to Sites Reservoir, and to deliver water from Sites Reservoir to service areas, the Sacramento River, and other locations to meet various water resources needs and uses.

It was determined that, to maximize operational flexibility, the diversion and conveyance facilities would need to be able to:

- Release water directly from Sites Reservoir to meet local needs in the vicinity of the existing GCID and T-C canals
- Release water in an integrated manner with existing CVP and SWP operations to facilitate meeting additional needs throughout the Bay-Delta system
- Release water directly to the Sacramento River to meet additional needs throughout the Bay-Delta system and provide downstream benefits for Delta water quality and water supply reliability (through additional supplies or alternative source) for CVP, SWP, and Level 4 wildlife refuge water supply. Additionally, the ability to release water directly to the Sacramento River would allow Sites Reservoir to respond to Delta emergencies, including releasing flows to repel saltwater intrusion following a Delta levee failure.

Conveyance facilities alternatives that would divert water from the Sacramento River included the existing GCID and T-C canals, and a new pipeline, known as the Delevan Pipeline. Tributary source conveyance facilities alternatives included new pipelines from the CBD and Stony Creek. Conveyance facilities alternatives that were evaluated initially had a range of capacity sizes, known as options (Table 2-20), and are illustrated schematically in Figure 2-8.

Table 2-20
Conveyance Facilities Alternatives Considered for Sites Reservoir

Conveyance Facility Alternative	Source	Option Capacity Description
GCID Canal[a]	Sacramento River at Hamilton City	Existing 1,800-cfs capacity Expand to 3,000-cfs capacity Expand to 4,000-cfs capacity Expand to 5,000-cfs capacity
T-C Canal[a]	Sacramento River at Red Bluff	Existing 2,100-cfs capacity Modify to 2,700-cfs capacity Expand to 4,000-cfs capacity Expand to 5,000-cfs capacity
Delevan Pipeline[b]	Sacramento River opposite Moulton Weir	1,500-cfs capacity 2,000-cfs capacity 3,000-cfs capacity 4,000-cfs capacity 5,000-cfs capacity
Colusa Basin Pipeline[b]	Colusa Basin Drain	1,000-cfs capacity 3,000-cfs capacity
Stony Creek Pipeline[b]	Stony Creek at Black Butte Afterbay	1,000-cfs capacity 2,100-cfs capacity

[a]Existing conveyance facility.
[b]Proposed new conveyance facility.
Notes:
cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
T-C = Tehama-Colusa
Source: DWR and Reclamation, 2008.

Each of the options for the conveyance alternatives were evaluated based on cost, the importance of providing direct release to the Sacramento River, and preliminary assessments of potential environmental and cultural resources impacts. Table 2-21 summarizes preliminary cost estimates for the conveyance alternative options and indicates the ability of the option to provide direct releases to the Sacramento River.

Table 2-21
Preliminary Cost and Sacramento River Direct Release Potential for the Sites Reservoir Conveyance Options

Conveyance Facility Alternative	Option Capacity Description	Cost Estimate[a] (millions)	Ability to Provide Direct Release to Sacramento River?
GCID Canal[b]	Existing 1,800-cfs capacity Expand to 3,000-cfs capacity Expand to 4,000-cfs capacity Expand to 5,000-cfs capacity	$178.5[d] $302.3 $463.8 $552.3	No No No No
T-C Canal[b]	Existing 2,100-cfs capacity Modify to 2,700-cfs capacity Expand to 4,000-cfs capacity Expand to 5,000-cfs capacity	$0 $110.9 $398.2 $556.5	No No No No
Delevan Pipeline[c]	1,500-cfs capacity 2,000-cfs capacity 3,000-cfs capacity 4,000-cfs capacity 5,000-cfs capacity	$364.9 $421.4 $574.3 $747.2 $917.2	Yes Yes Yes Yes Yes
Colusa Basin Pipeline[c]	1,000-cfs pipeline capacity 3,000-cfs pipeline capacity	$145.9 $362.9	No No
Stony Creek Pipeline[c]	1,000-cfs capacity 2,100-cfs capacity	$87.9 $168.3	No No

[a]Costs are 2007 preliminary construction costs and do not include mitigation, engineering, or administrative costs.

[b]Existing conveyance facility.

[c]Proposed new conveyance facility.

[d]Costs are not $0 due to the cost of restoring the design capacity of the GCID Canal for 14 miles. This cost was later removed because GCID would restore the 14 miles of Canal to design capacity as part of its required annual maintenance.

Notes:

cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
T-C = Tehama-Colusa

Source: DWR and Reclamation, 2008.

Based on DWR's and Reclamation's conveyance evaluation, the following options were eliminated from further consideration:

- **GCID Canal Expansions:** Expansion of the GCID Canal would require the acquisition of temporary and permanent rights-of-way. For example, the larger GCID Canal expansion options would require approximately 1,890 acres of land during construction. Permanent land area acquired for the canal expansion would be 940 acres, of which 727 acres are classified as prime agricultural land (preliminary estimates based on field survey). California's desire to preserve agricultural land is reflected in the California Land Conservation Act, also known as the Williamson Act. Other environmental considerations in the canal expansion footprint would include the loss of 286 elderberry stems greater than 1-inch in diameter, adverse effects to salmon and steelhead related to siphon enlargements, loss of giant garter snake habitat, disturbance of nesting habitat for the

Swainson's hawk, and extensive loss of jurisdictional wetlands, including vernal pools. The potential impacts to prime agricultural land and environmental resources associated with these facilities support the recommendation not to further evaluate GCID Canal expansions.

- **T-C Canal Modification and Expansions:** There were 2,468 acres of agricultural land determined to be within 100 feet of the T-C Canal modification and expansion area footprint; of these, 1,244 acres are classified as prime agricultural land (preliminary estimates based on field survey). Environmental considerations in the expansion area footprint would include the loss of vernal pool plants and invertebrates, loss of California tiger salamander habitat, loss of 170 elderberry stems greater than 1-inch in diameter, adverse effects to salmon and steelhead related to siphon enlargements, potential giant garter snake habitat loss, disturbance of nesting habitat for the Swainson's hawk, and loss of jurisdictional wetlands, including vernal pools. These potential impacts to prime agricultural land and environmental resources support the recommendation not to further evaluate T-C Canal modifications or expansion.
- **4,000 and 5,000 cfs Delevan Pipeline:** These options were determined to be inefficient and infeasible due to cost, which would be $747 million and $917 million, respectively. These preliminary construction cost estimates are presented in 2007 dollars and do not include mitigation, engineering, or administrative costs. Additionally, the smaller pipeline sizes were determined to be able to reliably fill and drain Sites Reservoir when combined with other conveyance options.
- **Colusa Basin Pipeline:** The water from the CBD is considered to be of relatively poor water quality when compared to Sacramento River water and is, therefore, less desirable. The CBD is the single largest source of agricultural return flows to the Sacramento River; as a result, it has elevated values for alkalinity, electrical conductivity, and total dissolved solids. Nitrogen and phosphorus concentrations also are generally higher in the CBD. Water taken from the CBD into Sites Reservoir and then released back through the conveyance system could cause water quality impacts to local agricultural users and create a new point source of relatively lower quality water if discharged into the Sacramento River. Therefore, neither Colusa Basin Pipeline conveyance option was recommended for further consideration.
- **Stony Creek Pipeline:** The Stony Creek Pipeline conveyance options would rely on increased capacity of the T-C Canal downstream of Orland. The T-C Canal modification and expansion conveyances were eliminated from further consideration (as indicated above); therefore, the Stony Creek Pipeline conveyance options were also eliminated from further consideration.

The conveyance options retained were:

- T-C Canal at its existing capacity of 2,100 cfs
- GCID Canal at its existing capacity of 1,800 cfs
- A new Delevan Pipeline at capacities of 1,500 cfs, 2,000 cfs, and 3,000 cfs

The T-C and GCID canals at their existing capacities would be the most cost-effective conveyance options. These conveyance options were retained because they could be combined to provide conveyance packages with up to 6,900 cfs total capacity for use in initial alternative development. In addition, these conveyance options allowed for an evaluation of benefits associated with the proposed Delevan Pipeline's ability to return water directly to the Sacramento River.

2.5.3 Sites Reservoir Operational Alternatives

Eight initial Sites Reservoir operational alternatives, each with a range of conveyance packages and operational emphases, were considered and evaluated with the CalSim-II operations model in the NODOS Plan Formulation Report (DWR and Reclamation, 2008). The operational alternatives assumed a Sites Reservoir storage size of 1.8 MAF. All of the initial Project operational alternatives evaluated met the proposed Project's primary objectives, but to varying degrees. The proposed Project operational alternative that emphasized a balanced mix of benefits to water supply reliability, water quality, and ecosystem enhancement generated the greatest net annual economic benefit and minimized environmental impacts, and therefore was selected as the operational scenario for detailed evaluation in this environmental document. This operational alternative was the only one evaluated that resulted in economic benefits that exceeded costs (i.e. benefit-cost ratio greater than 1.0). The other operational alternatives that prioritized one benefit category (i.e. water supply reliability, water quality, or ecosystem enhancement) were eliminated from further consideration.

2.5.4 Sites Reservoir Storage, Conveyance, and Operations Formulation

Based on the initial evaluation of storage, conveyance and operational alternatives, the following proposed Project features were retained for further evaluation:

- Sites Reservoir Storage: 800 TAF, 1.27 MAF, and 1.81 MAF
- Sites Reservoir Conveyance: existing T-C Canal (2,100-cfs capacity), existing GCID Canal (1,800-cfs capacity), and new Delevan Pipeline (1,500-cfs, 2,000-cfs, and 3,000-cfs capacity)
- Operational scenario that emphasized a balanced mix of benefits to water supply reliability, water quality, and ecosystem enhancement

To further evaluate and optimize reservoir storage and conveyance options, preliminary costs were estimated and operations modeling was performed. Table 2-22 identifies the reservoir storage and conveyance facility options that were evaluated and their associated total capital costs.

The purpose of the operations modeling was to reduce the number of possible Project combinations and to help formulate Sites Reservoir alternatives with the most efficient conveyance options and reservoir storage sizes. The operations simulations modeling was performed using an assumed operational scenario that provided a balanced mix of water supply reliability, water quality, and ecosystem enhancement. This operational scenario was similar to the operational scenario described above that generated the greatest net economic benefits. The water supply yield of the conveyance options and Sites Reservoir storage combinations was analyzed for long-term average and driest period's average hydrologic conditions. Preliminary economic evaluation was performed to value the water supply yield benefits for each combination. Net annual economic benefits were estimated and used as the primary economic metric to rank and compare the combinations as shown in Table 2-23.

Based on the preliminary operations simulations described above, a 3,000-cfs Delevan Pipeline was eliminated from consideration. Preliminary modeling results of the above-listed conveyance options indicated that a 2,000-cfs conveyance was adequate to meet the proposed Project objectives. Constructing a larger Delevan Pipeline would require a larger intake/discharge structure that would result in greater environmental impacts due to its presence in an area that has sensitive habitat. Constructing a larger pipeline would also significantly increase the construction cost and operational expense. Therefore, a 3,000-cfs Delevan Pipeline was not considered further.

Table 2-22
Sites Reservoir Storage and Conveyance Options Combinations

Reservoir Storage (TAF)	Conveyance				Capital Cost ($Billion, 2007)*
	T-C+GCID Capacity (cfs)	Delevan Pipeline: Diversion Capacity (cfs)	Delevan Pipeline: Release Capacity (cfs)	Total Diversion Capacity (cfs)	
800	3,900	0	0	3,900	$1.96
800	3,900	1,500	1,125	5,400	$2.92
800	3,900	2,000	1,500	5,900	$3.13
800	3,900	3,000	2,250	6,900	$3.56
1,270	3,900	0	0	3,900	$2.22
1,270	3,900	1,500	1,125	5,400	$3.15
1,270	3,900	0	1,500	3,900	$3.09
1,270	3,900	2,000	1,500	5,900	$3.36
1,270	3,900	3,000	2,250	6,900	$3.79
1,810	3,900	0	0	3,900	$2.64
1,810	3,900	1,500	1,125	5,400	$3.56
1,810	3,900	0	1,500	3,900	$3.50
1,810	3,900	2,000	1,500	5,900	$3.77
1,810	3,900	0	2,250	3,900	$3.82
1,810	3,900	3,000	2,250	6,900	$4.19

*This date is associated with the cost estimates from the NODOS Investigation Plan Formulation Report (DWR and Reclamation 2008).

Notes:

cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
TAF = thousand acre-feet
T-C = Tehama-Colusa

Source: DWR, 2011.

Table 2-23 presents a preliminary estimate of the net annual economic benefit that is associated with each reservoir storage and conveyance options combination that was retained, ranked in order of highest to lowest potential net annual economic benefit.

As shown in Table 2-23, the first three reservoir storage and conveyance options combinations are estimated to perform much better than the remainder of the reservoir storage and conveyance options combinations that were considered. These three reservoir size and conveyance options combinations were combined with new hydropower facilities to develop three configurations of Sites Reservoir denoted as Alternative A, Alternative B, and Alternative C in this DEIR/S. These action alternatives and the No Project/No Action Alternative provided a range of alternatives for further refinement and detailed analysis in the Feasibility Report and DEIR/EIS. The Red Bank, Colusa, Newville, and Sites reservoir alternatives considered and described previously and these refined action alternatives together provide a reasonable range and serve to meet the requirements of CEQA; NEPA; other pertinent federal, State, and local laws, regulations, and policies; and the Principles and Guidelines (P&Gs) presented in the U.S. Water Resources Council's *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (USWRC,1983). Following is a brief description of the No Project/No Action Alternative and Alternatives A, B, and C that are evaluated in this DEIR/EIS:

- **No Project/No Action Alternative:** The No Project/No Action Alternative assumes that no actions would be taken to provide storage north of the Delta to improve water supply reliability, to enhance the survivability of anadromous fish or drinking water quality in the Delta, or to improve flexible hydropower generation.

- **Alternative A – 1.27-MAF Sites Reservoir with Delevan Pipeline:** Alternative A includes a 1.27-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals and a new Delevan Pipeline (2,000-cfs diversion/1,500-cfs release). This alternative also includes new hydropower facilities.
- **Alternative B – 1.81-MAF Sites Reservoir with Release-only Delevan Pipeline:** Alternative B includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals, and a new release-only Delevan Pipeline (1,500-cfs release). This alternative also includes new hydropower facilities.
- **Alternative C – 1.81-MAF Sites Reservoir with Delevan Pipeline:** Alternative C includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals and a new Delevan Pipeline (2,000-cfs diversion/1,500-cfs release). This alternative also includes new hydropower facilities.

Table 2-23
Preliminary Net Economic Benefit Estimates for Sites Reservoir Storage and Conveyance Options Combinations

Reservoir Storage (TAF)	Conveyance				Net Annual Benefit ($Million, 2007)
	TC+GCID Capacity (cfs)	Delevan Pipeline: Diversion Capacity (cfs)	Delevan Pipeline: Release Capacity (cfs)	Total Diversion Capacity (cfs)	
1,810	3,900	0	1,500	3,900	$16.3
1,270	3,900	2,000	1,500	5,900	$16.2
1,810	3,900	2,000	1,500	5,900	$14.1
1,270	3,900	1,500	1,125	5,400	$7.6
1,810	3,900	1,500	1,125	5,400	$7.9
1,810	3,900	0	2,250	3,900	$4.1
1,270	3,900	0	1,500	3,900	-$0.7
800	3,900	1,500	1,125	5,400	-$14.1
800	3,900	2,000	1,500	5,900	-$17.4
1,270	3,900	0	0	3,900	-$18.1
800	3,900	0	0	3,900	-$23.0
1,810	3,900	0	0	3,900	-$33.7

Notes:
cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
TAF = thousand acre-feet
T-C = Tehama-Colusa

Source: DWR, 2011.

Maps and detailed descriptions of each of the proposed Project action alternatives, including descriptions of construction, operation, and maintenance activities associated with each proposed Project feature, as well as a description of assumed Project operations, are provided in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives.

2.6 References

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Figures

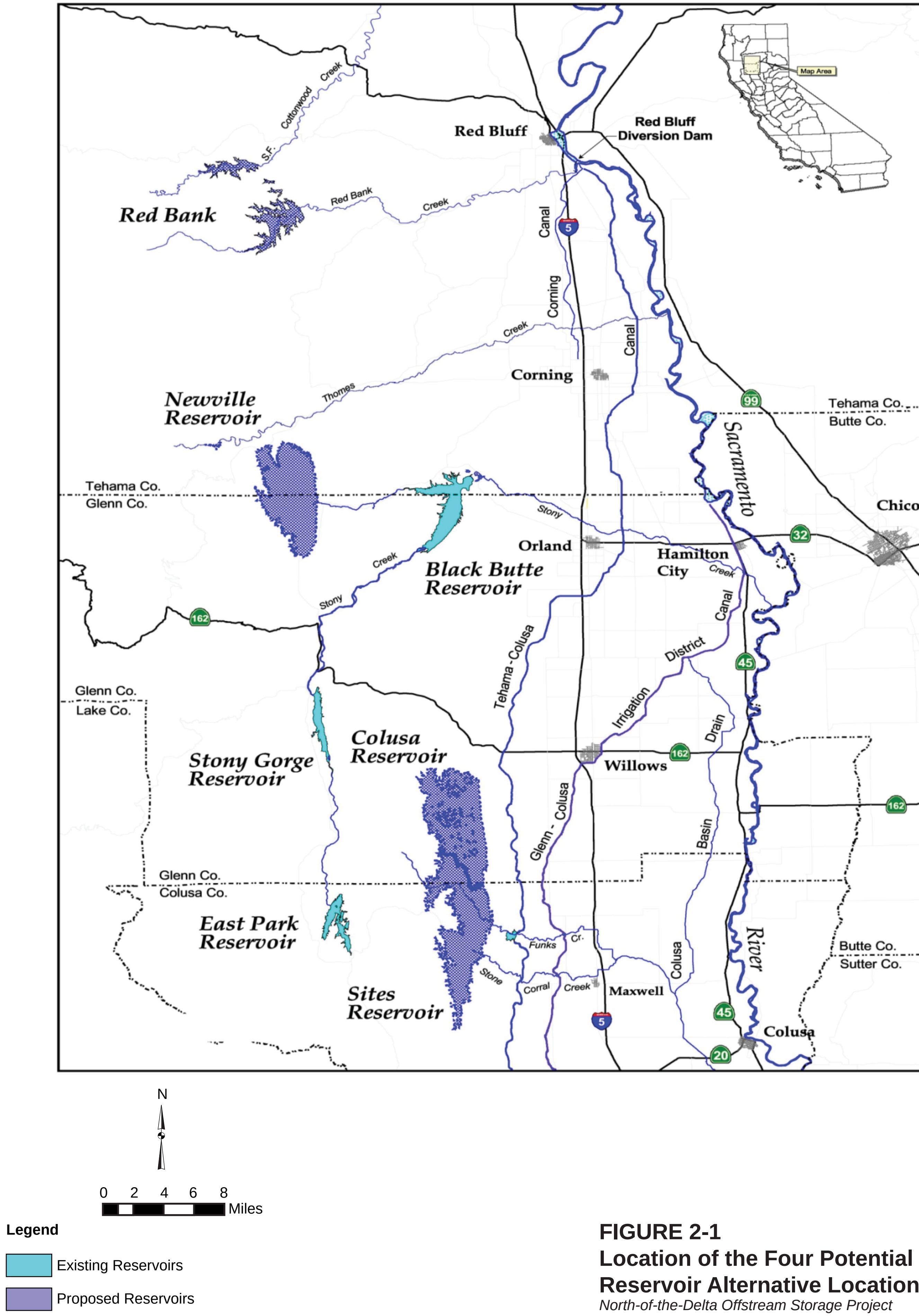
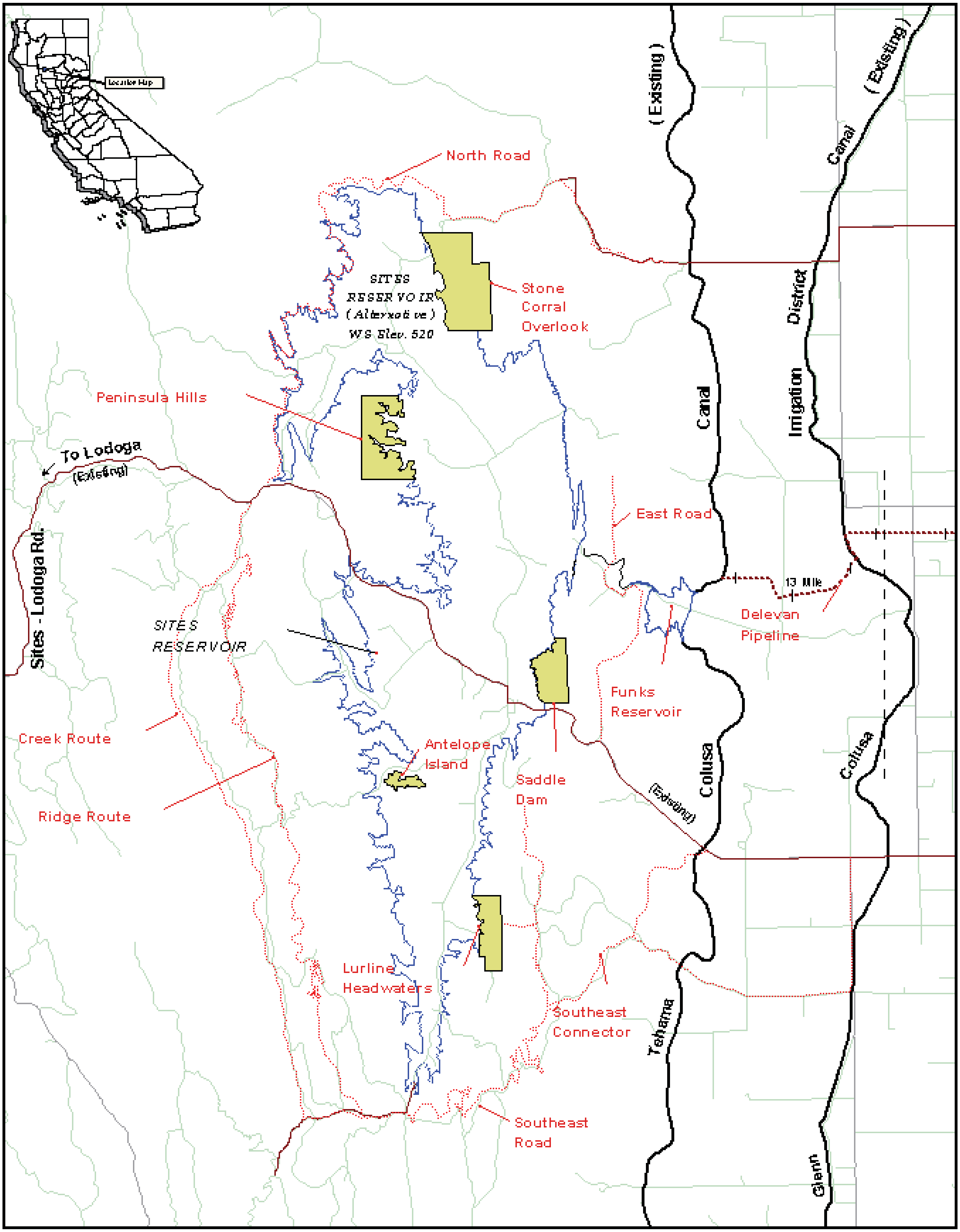


FIGURE 2-1
Location of the Four Potential Reservoir Alternative Locations
North-of-the-Delta Offstream Storage Project



Proposed Road Relocations
Existing Roads
Proposed Reservoir Boundary
Proposed Recreation Areas

N

0 0.5 1 1.5 2 Miles

FIGURE 2-2
Sites Reservoir Alternative Project Features
North-of-the-Delta Offstream Storage Project

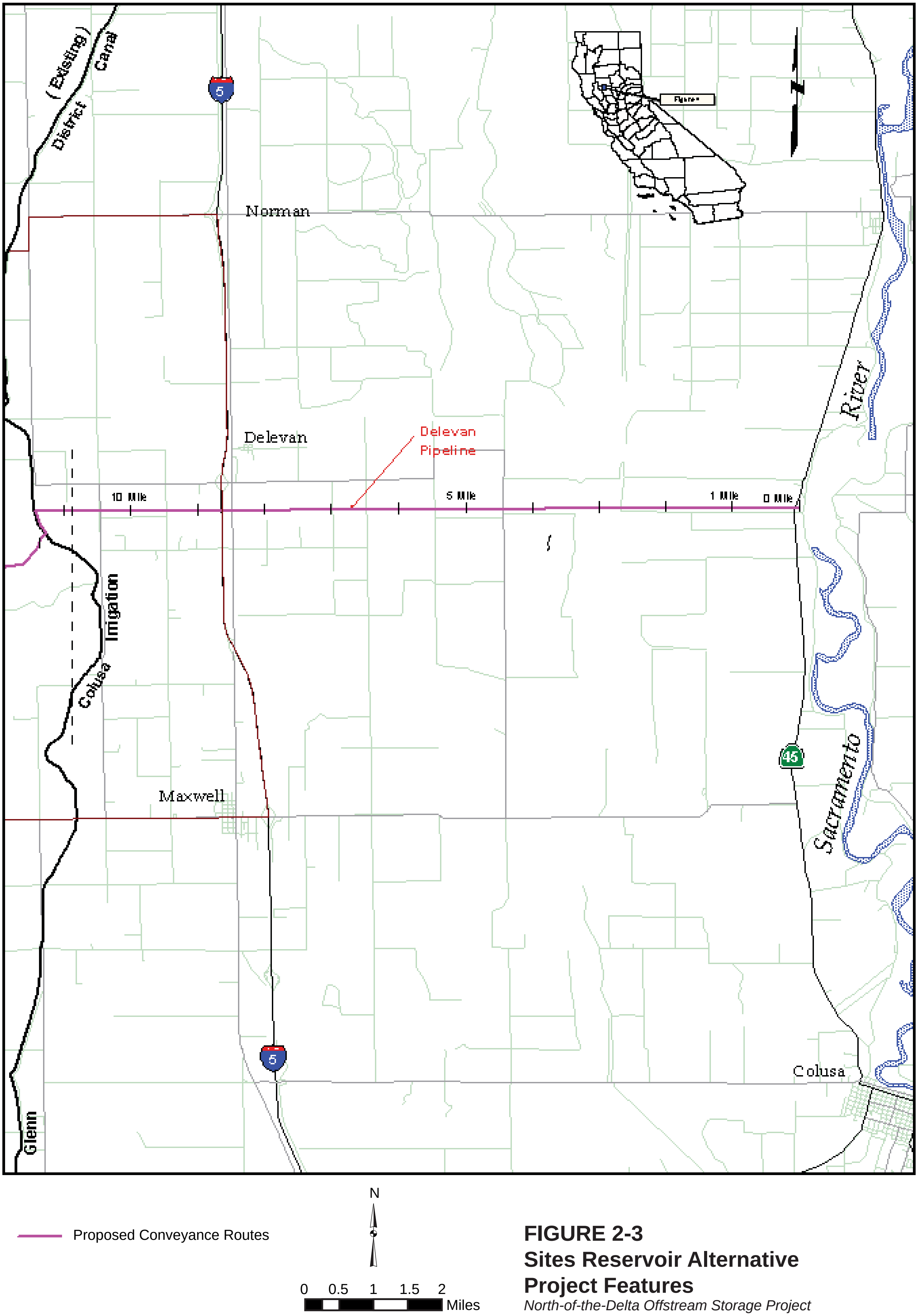
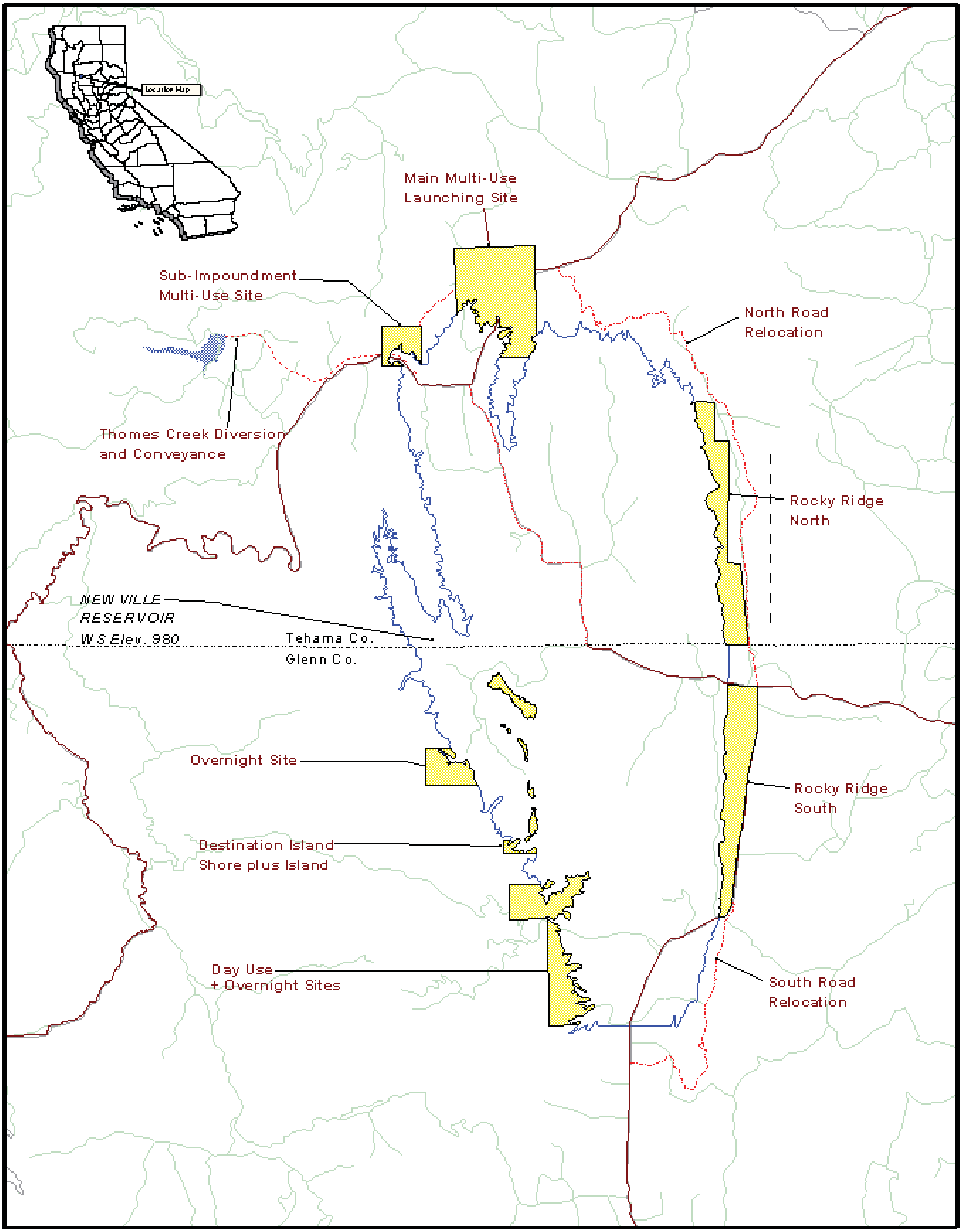


FIGURE 2-3
Sites Reservoir Alternative Project Features
North-of-the-Delta Offstream Storage Project



Proposed Road Relocations
Existing Roads
Proposed Reservoir Boundary
Proposed Recreation Areas

N

0 0.5 1 1.5 2 Miles

FIGURE 2-4
Newville Reservoir Alternative
Project Features
North-of-the-Delta Offstream Storage Project

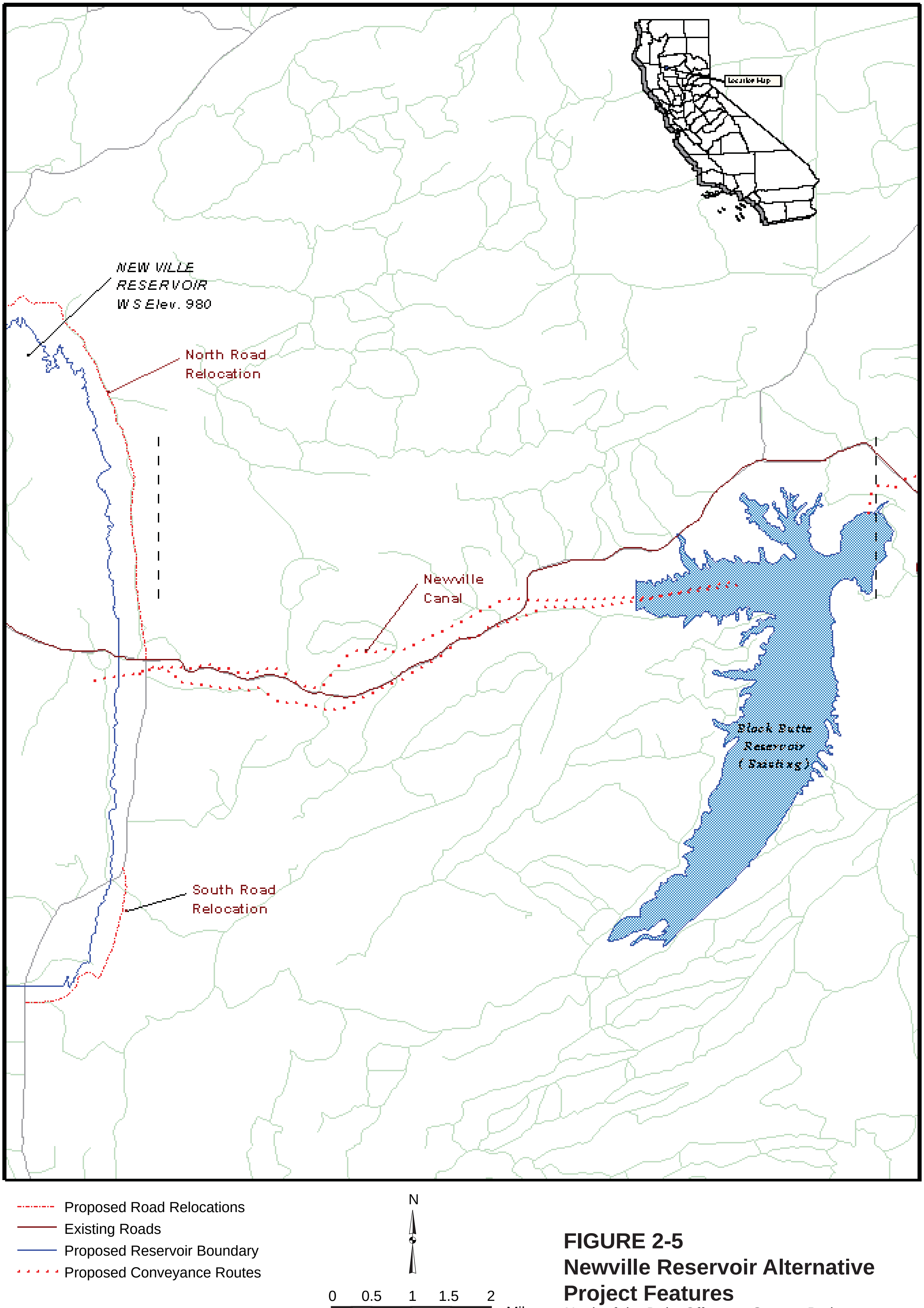


FIGURE 2-5
Newville Reservoir Alternative Project Features
North-of-the-Delta Offstream Storage Project

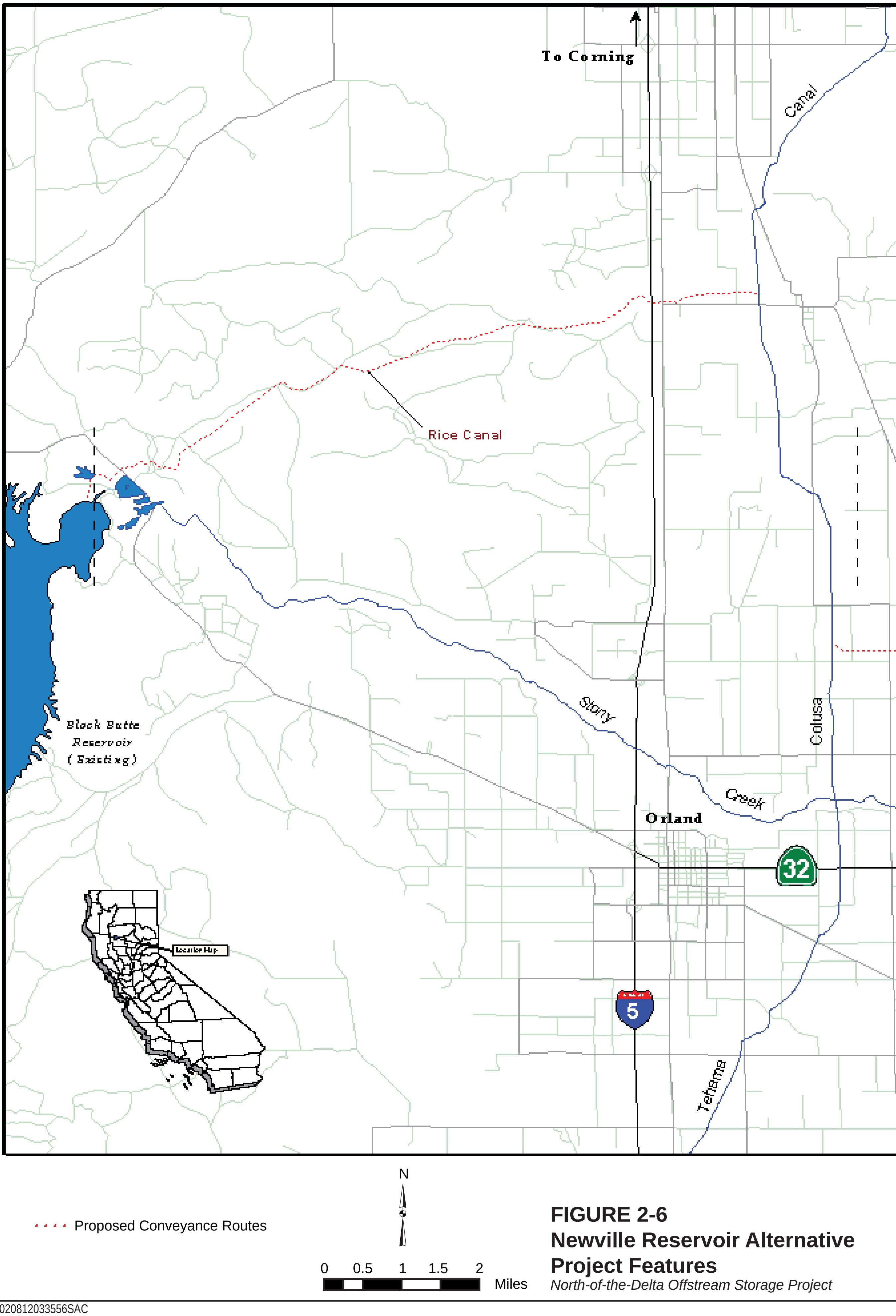


FIGURE 2-6
Newville Reservoir Alternative
Project Features
North-of-the-Delta Offstream Storage Project

WBG020812033556SAC

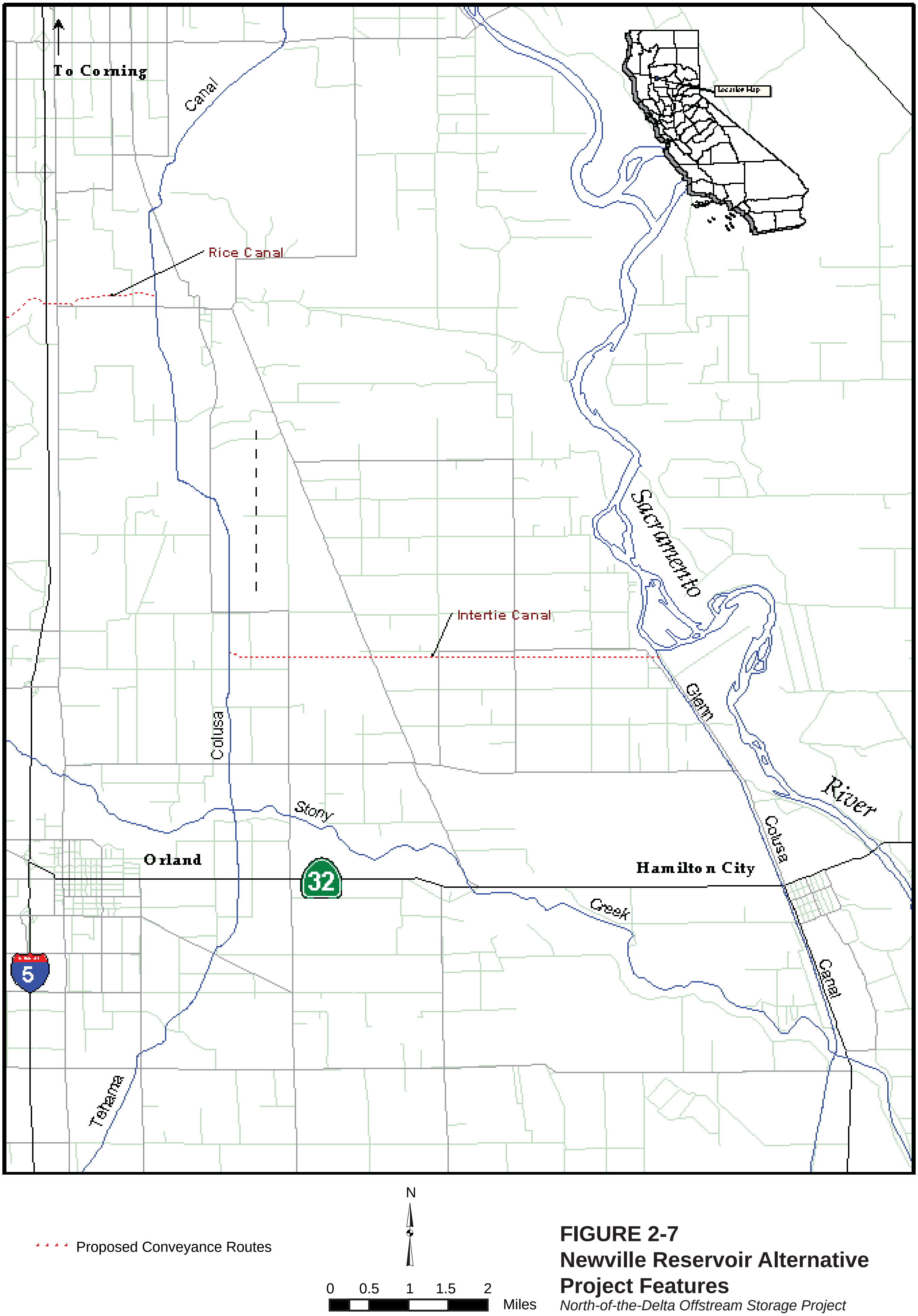


FIGURE 2-7
Newville Reservoir Alternative
Project Features
North-of-the-Delta Offstream Storage Project

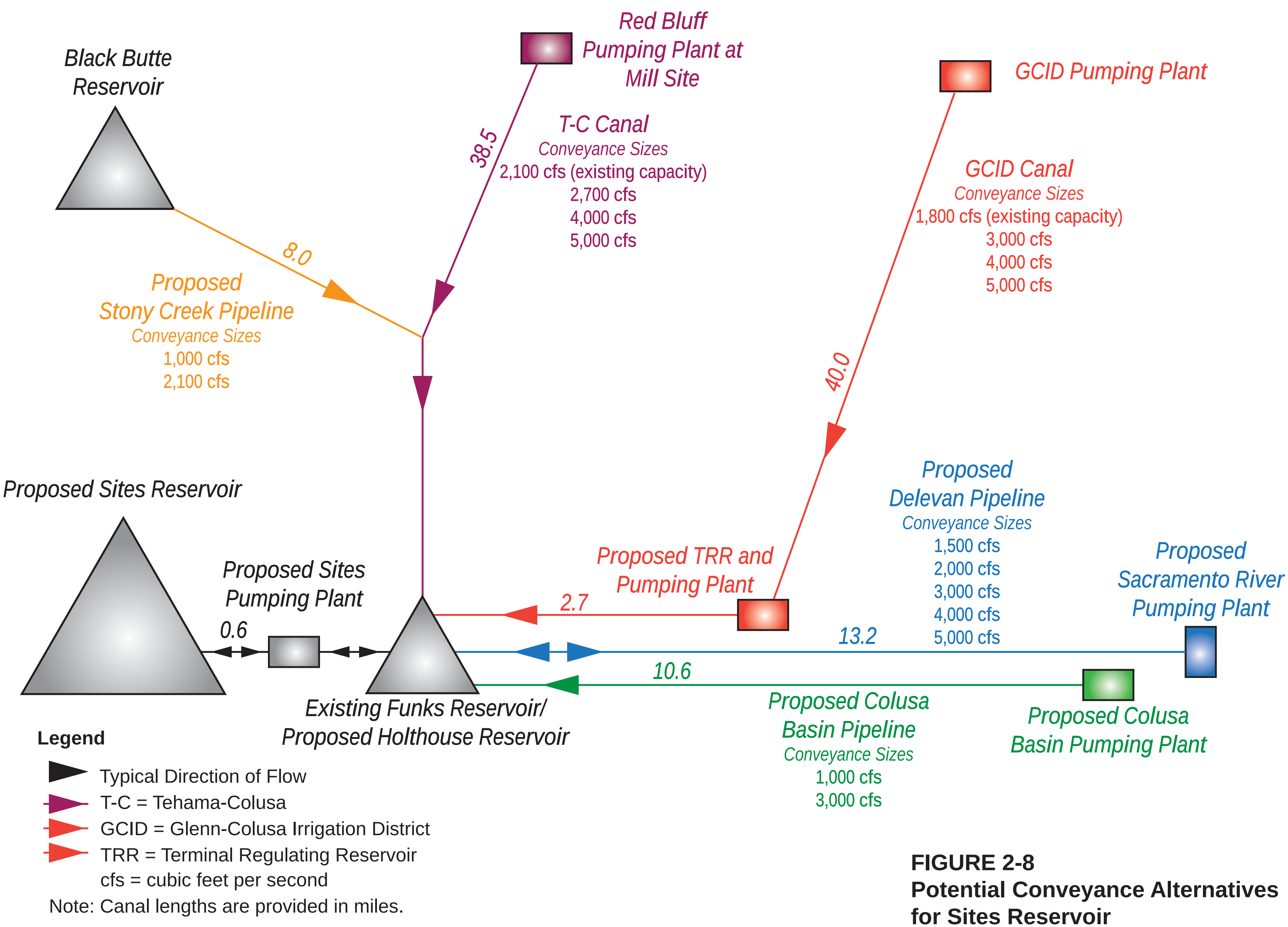


FIGURE 2-8
Potential Conveyance Alternatives for Sites Reservoir
North-of-the-Delta Offstream Storage Project

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3. Description of the Proposed Project/Proposed Action and Alternatives

This chapter describes the three proposed Project action alternatives that are evaluated in this DEIR/EIS. For descriptions of Existing Conditions and the No Project/No Action Alternative, refer to Chapter 2 Alternatives Analysis. For a depiction of the proposed Project facilities included for each of the action alternatives, refer to Figures 1-9A, 1-9B, and 1-9C in Chapter 1 Introduction for Alternatives A, B, and C, respectively.

3.1 Proposed Project Features and Facilities

Provided below are descriptions of the common and unique proposed Project facilities that are components of the three action alternatives. Table 3-1 provides a summary list of proposed Project features for each alternative.

Table 3-1
Proposed Project Features by Action Alternatives

Project Feature	Component of		
	Alternative A	Alternative B	Alternative C
1.27-MAF Sites Reservoir (requires 9 dams total)	Yes	No	No
1.81- MAF Sites Reservoir (requires 11 dams total)	No	Yes	Yes
Golden Gate and Sites Dams	Yes	Yes	Yes
9 Saddle Dams	No	Yes	Yes
7 Saddle Dams	Yes	No	No
Up to 5 Recreation Areas	Yes	Yes	Yes
Road Relocations and South Bridge	Yes	Yes	Yes
Sites Pumping/Generating Plant	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 3,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity
Electrical Switchyards	Yes	Yes	Yes
Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Field Office Maintenance Yard	Yes	Yes	Yes
Holthouse Reservoir Complex (includes Holthouse Reservoir and Dam, breached Funks Dam, existing Funks Reservoir Dredging, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, T-C Canal Bypass Pipeline, and Holthouse to T-C Canal Pipeline)	Yes	Yes	Yes
Pump Installation at the Red Bluff Pumping Plant	Yes	Yes	Yes
GCID Canal Facilities Modifications	Yes	Yes	Yes

Table 3-1
Proposed Project Features by Action Alternatives

Project Feature	Component of		
	Alternative A	**Alternative B**	**Alternative C**
GCID Canal Connection to the Terminal Regulating Reservoir (TRR)	Yes	Yes	Yes
TRR (includes the TRR to Funks Creek Pipeline and Outlet)	Yes	Yes	Yes
TRR Pumping/Generating Plant	Yes	Yes	Yes
TRR Pipeline (3.5-mile-long pipeline to convey water from the TRR to Holthouse Reservoir) and TRR Pipeline Road	Yes	Yes	Yes
Delevan Transmission Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E[1] Line plus WAPA/PG&E Line to Sacramento River	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line plus WAPA/PG&E Line to Sacramento River
Delevan Pipeline (2,000 cfs with 2 pipelines)	Yes	Yes	Yes
Delevan Pipeline Intake Facilities (includes fish screen and pumping/generating facilities)	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity	No	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity
Delevan Pipeline Discharge Facility	No	Yes; 1,500 cfs release capacity	No
Project Buffer	Yes	Yes	Yes
Potential Acreage of Temporary Land Use Impacts	17,680	19,637	19,636
Potential Acreage of Permanent Land Use Impacts	26,425	26,424	26,425

Note:
MAF = million acre-feet

3.1.1 Proposed Project Facilities Common to all Action Alternatives

Many proposed Project facilities are common to the three action alternatives (Alternatives A, B, and C) evaluated in this draft EIR/EIS.

These proposed Project facilities, all of which are considered integral to the performance of the proposed Project, are identified on Figure 3-1 and include the following features that are common to all action alternatives:

- Sites Reservoir Inundation Area (Section 3.1.1.1)
- Recreation Areas (Section 3.1.1.2)
- Road Relocations and South Bridge (Section 3.1.1.3)
- Sites Pumping/Generating Plant (Section 3.1.1.4)

[1] The proposed Project would connect with either the existing PG&E Transmission Line or the existing WAPA Transmission Line.

- Electrical Switchyards (Section 3.1.1.5)
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure (Section 3.1.1.6)
- Sites Reservoir Inlet/Outlet Structure (Section 3.1.1.7)
- Field Office Maintenance Yard (Section 3.1.1.8)
- Holthouse Reservoir Complex (Section 3.1.1.9)
- Pump Installation at the Red Bluff Pumping Plant (Section 3.1.1.10)
- GCID Canal Facilities Modifications (Section 3.1.1.11)
- GCID Canal Connection to Terminal Regulating Reservoir (TRR) (Section 3.1.1.12)
- Terminal Regulating Reservoir (Section 3.1.1.13)
- TRR Pumping/Generating Plant (Section 3.1.1.14)
- TRR Pipeline and TRR Pipeline Road (Section 3.1.1.15)
- Delevan Pipeline (Section 3.1.1.16)
- Project Buffer (Section 3.1.1.17)

The following are Project-related ecosystem enhancement actions common to all action alternatives:

- Ecosystem Enhancement Storage Account—Operational Actions (Section 3.1.2.1)
- Ecosystem Enhancement Fund—Nonoperational Actions (Section 3.1.2.2)

These proposed Project facilities and operational and non-operational ecosystem enhancement actions are discussed in detail in the following sections.

3.1.1.1 Sites Reservoir Inundation Area

The proposed Sites Reservoir would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell (Figure 3-1). The smallest reservoir configuration considered for the action alternatives is 1.27 million acre-feet (MAF), which is discussed in Section 3.1.4.1 and the largest reservoir configuration considered for the action alternatives is 1.81 MAF, which is discussed in Section 3.1.5.1. The inundation area of Sites Reservoir would be created by filling Antelope Valley after the construction of up to 11 dams, depending on the reservoir size. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, and various saddle dams on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (dams are discussed further in Sections 3.1.4.2 and 3.1.5.2).

Construction. Construction information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

Operations. Operations information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

Maintenance. Maintenance information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

3.1.1.2 Recreation Areas

The development of up to five Recreation Areas at the proposed Sites Reservoir could meet public demand for recreation opportunities. Potential Recreation Areas at Sites Reservoir were screened based on the site topography and the effect of potentially large fluctuations in the water surface levels due to normal reservoir operations. Five locations were determined to be potentially feasible recreation areas:

- **Stone Corral Recreation Area –** The Stone Corral Recreation Area (Figure 3-2A) would be located on the eastern shore of the proposed Sites Reservoir, north of the existing Maxwell Sites Road and proposed Sites Dam. Access would be provided by either the proposed South Bridge or Eastside roads. The maximum proposed size of the Stone Corral Recreation Area is 235 acres.
- **Saddle Dam Recreation Area –** The Saddle Dam Recreation Area (Figure 3-2B) would be located on the northeast side of the proposed Sites Reservoir, along the edges of the proposed Saddle Dams 3, 4, and 5. Access would be provided from the proposed Saddle Dam Road via the proposed North Road. The maximum proposed size of the Saddle Dam Recreation Area is 329 acres.
- **Peninsula Hills Recreation Area –** The Peninsula Hills Recreation Area (Figure 3-2C) would be located on the northwest shore of the proposed Sites Reservoir, to the north of the existing Sites Lodoga Road and across the reservoir from the proposed Saddle Dam Recreation Area. Access would be provided from the proposed Peninsula Road via the existing Sites Lodoga Road. The maximum proposed size of the Peninsula Hills Recreation Area is 373 acres.
- **Antelope Island Recreation Area –** The Antelope Island Recreation Area (Figure 3-2D) would be located in the southwestern portion of the proposed Sites Reservoir. Antelope Island would offer boat-in access only; however, during construction, a temporary road would provide access to the island. The maximum proposed size of the Antelope Island Recreation Area is 49 acres.
- **Lurline Headwaters Recreation Area –** The Lurline Headwaters Recreation Area (Figure 3-2E) would be located near the southeast tip of the proposed Sites Reservoir. Access would occur from the proposed Lurline Road. The maximum proposed size of the Lurline Headwaters Recreation Area is 219 acres.

The proposed Sites Reservoir has the potential to support an average of approximately 410,000 recreation days annually. Collectively, recreation opportunities at the proposed Recreation Areas could provide: boating, camping, picnicking, fishing, swimming, and hiking. Depending on the recreation area, proposed facilities may include boat launch sites, trails, designated swimming and fishing access, picnic tables, shaded canopies, campfire rings/barbeques, vault toilets, and dumpsters. In addition, gravel parking areas would be provided for camp sites, day-use areas, and boat launch facilities. An initial phase of recreation development would be implemented, consistent with a Recreation Plan that would be developed. Some subset of these recreational facilities may be constructed initially based on the environmental analysis included in this DEIR/EIS and Homeland Security guidelines, but all five Recreation Areas could potentially be constructed in the future.

The approximate number of proposed facilities at each proposed recreation area is listed in Table 3-2.

Table 3-2
Approximate Number of Proposed Facilities at the Proposed Recreation Areas

Recreation Areas	Features
Stone Corral Recreation Area	50 campsites (car and recreational vehicle) 10 picnic sites (with parking at each site) 6-lane[a] boat launch site Hiking trails Electricity Potable Water[b] 1 kiosk 10 vault toilets

Table 3-2
Approximate Number of Proposed Facilities at the Proposed Recreation Areas

Recreation Areas	Features
Saddle Dam Recreation Area	10 picnic sites (with parking at each site) Swim area (50 parking stalls) Fishing access parking (20 stalls) Hiking trails 1 kiosk 5 vault toilets
Peninsula Hills Recreation Area	200 campsites (car and recreational vehicle) 1 group camp area[c] 10 picnic sites (with parking at each site) Hiking trails Electricity Potable Water[b] 1 kiosk 19 vault toilets
Antelope Island Recreation Area	12 campsites (boat-in) Hiking trails 1 vault toilet
Lurline Headwaters Recreation Area	50 campsites (car and recreational vehicle) 3 group camp areas 10 picnic sites (with parking at each site) Fishing access parking (10 stalls) Hiking trails Electricity 1 kiosk 8 vault toilets

[a]Reducing the number of boat lanes with increasing water depth.
[b]Treated water from the reservoir will be the source of potable water.
[c]Each group camp area has been sized to accommodate 24 people.

Construction. It is anticipated that all construction activities associated with the five Recreation Areas would occur within the proposed footprints of the recreation areas and the temporary and permanent access road areas. The total construction disturbance area of the five Recreation Areas would be approximately 1,205 acres. However, construction disturbance may be much less because recreational facilities would be designed and constructed to minimize vegetative disturbance, including tree removal.

Anticipated ground-disturbing activities at potential Recreation Areas during construction include:

- Surveying
- Clearing and grubbing
- Excavation
- Backfilling
- Road and parking lot construction
- Utility connections
- Installation of amenities
- Boat ramp construction
- Site revegetation

Operations. It is anticipated that the proposed Recreation Areas would not have onsite staff. A fee collection box and camping information would likely be available at the kiosk near each recreation area's entrance. It is expected that the majority of use at the proposed facilities would occur between Memorial Day (end of May) and Labor Day (beginning of September) of each year, but that activities such as hiking and fishing may occur year-round.

Maintenance. Maintenance activities would include collection of overnight and day-use fees at the fee collection boxes, road grading, water system maintenance, trash removal at picnic sites and overnight campsites, vegetation maintenance, restroom/vault toilet cleaning and restocking of paper goods, boat ramp debris removal, lake debris control, lake hazard marking, lake boom and barrier maintenance, signage, fence maintenance, fuels management, and law enforcement. During peak recreation use periods, these activities would likely occur on a daily basis, except for road grading, which is expected to occur once per year prior to the start of the recreation season. During the non-peak seasons, the activities other than road grading would likely occur on a weekly basis.

3.1.1.3 Road Relocations and South Bridge

The proposed Sites Reservoir would inundate several roads within Colusa County's jurisdiction. Travel between the towns of Maxwell and Lodoga along the existing Maxwell Sites Road and Sites Lodoga Road would be blocked by the new reservoir. Approximately six miles of the existing Huffmaster Road, a gravel county road, would also be inundated. Huffmaster Road provides access to private properties primarily within the proposed Sites Reservoir footprint and the community of Leesville, southwest of the proposed reservoir. Peterson Road, also a gravel county road that provides access to private property, is located entirely within the proposed reservoir footprint. Existing roads would be rerouted, as necessary, to provide alternate access routes.

Approximately 46 miles of new roads would provide construction and maintenance access to the proposed Project facilities, as well as provide public access to the proposed Recreation Areas. The locations of proposed roads, the proposed South Bridge, and existing roads near the proposed Sites Reservoir that would be affected by Project construction and/or operation are shown in Figures 3-3A and 3-3B.

Five road alternatives were evaluated to determine the best method of connecting the towns of Maxwell and Lodoga. To determine the best road alternative available, weighted criteria were independently assessed for shortest travel time, least total cost, least annual operations and maintenance cost, shortest emergency response time, least impact to wildlife habitat, least impact to wetlands and riparian areas, and least impact to public safety. Of the road alternatives, the South Bridge Alternative had the highest ranking. The portions of Maxwell Sites and Sites Lodoga roads that would be inundated by the proposed reservoir would be replaced by a new bridge (South Bridge Alternative). The road would start approximately one mile east of the proposed Sites Dam on Maxwell Sites Road. The new route would consist of the proposed Eastside Road, Stone Corral Road, the South Bridge, and an approach road west to Sites Lodoga Road. This route would also provide access to the proposed Stone Corral Recreation Area.

The proposed South Bridge would be a two-lane concrete bridge 35.5 feet wide and approximately 1.6 miles long. The top deck elevation would be 45 feet above the proposed Sites Reservoir's maximum normal water surface elevation. For the roads leading up to and away from the bridge, the proposed road right-of-way would be 60 feet wide with a four percent grade. Culverts and minor bridges would be constructed to provide passage for streams and drainage of surrounding areas, including the construction of a culvert where the proposed Eastside Road would cross Funks Creek. Guardrails, signs, striping and lighting would be installed after the roads are completed pursuant to Caltrans/AASHTO design specifications. Permanent fencing would be installed along both edges of the right-of-way (60 foot width).

The proposed North Road and Saddle Dam Road (both new gravel roads) would provide access to northern portions of the proposed Sites Reservoir, saddle dams, and Saddle Dam Recreation Area. A new road, Eastside Road, would be gravel from the existing County Road 69 to near the proposed Sites Pumping/Generating Plant, and paved south of the plant. The proposed Eastside Road would connect the proposed Stone Corral Road to County Road 69, providing access to the northern portions of the proposed Sites Reservoir, Holthouse Reservoir Complex, Golden Gate Dam and appurtenant structures, and to properties northeast of the proposed Sites Reservoir. Along the west side of the proposed Sites Reservoir, the proposed Peninsula Road would provide access from Sites Lodoga Road to the proposed Peninsula Hills Recreation Area. The proposed Sulphur Gap Road would provide access to southern portions of the proposed Sites Reservoir, the Lurline Headwaters Recreation Area, private property adjacent to the proposed Com Road, and would connect to Huffmaster Road.

The proposed road alignment around the proposed saddle dams on the northern rim would not change for the three alternatives. However, Alternatives B and C would require approximately 1.2 miles of additional roads to access Saddle Dams 1 and 2. Saddle Dams 1 and 2 would not be needed for Alternative A (Alternative A includes a small saddle dam north of Golden Gate Dam, also called Saddle Dam No. 1. This small Saddle Dam No. 1 is different from the Saddle Dam No. 1 included in Alternatives B and C). The access road to Golden Gate Dam would be longer in Alternative A because the dam would be set farther back (approximately 0.25 mile long in Alternatives B and C versus 0.55 mile in Alternative A). Alternatives B and C would require approximately 0.4 mile of additional spur roads to access the saddle dams that would be set back further than Alternative A.

Permanent facility access roads constructed from gravel and asphalt would facilitate operation and maintenance activities. These proposed access roads would require new construction or the relocation of existing public county roads and bridges; these activities would follow Caltrans and AASHTO design standards. During construction, gravel roads would be constructed on the following detour and construction roads: the proposed Sulphur Gap and Lurline roads, and an existing dirt road west of the proposed Lurline Headwaters Recreation Area to Huffmaster Road.

Characteristics of the proposed roadways, South Bridge, and the minor structures, respectively, are listed in Tables 3-3, 3-4, and 3-5.

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Roads that Require Detour				
Huffmaster Road				
Lurline Road to Sites Lodoga Road	3.41			3.41
Lurline Road				
Lurline Headwaters Recreation Area to Huffmaster Road	1.35			1.35
Sulphur Gap Road to Lurline Headwaters Recreation Area	1.85			1.85
Sulphur Gap Road				
Maxwell Sites Road to Lurline Road	3.45			3.45

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Roads that do not Require Detour				
Com Road	**2.95**			**2.95**
Lurline Road to Communication Tower	2.95			2.95
Eastside Road	**5.16**	**4.08**		**9.24**
Field Office Maintenance Yard Access to Sites Pumping/Generating Plant Access		0.93		0.93
Golden Gate Dam/Electrical Switchyard Access Roads to Property North of Golden Gate Dam	1.52			1.52
Maxwell Sites Road to Stone Corral Road		1.12		1.12
Property North of Golden Gate Dam to North Road	3.63			3.63
Sites Pumping/Generating Plant Access to Golden Gate Dam/Electrical Switchyard Access Roads		0.95		0.95
Stone Corral Road to Field Office Maintenance Yard		1.09		1.09
North Road	**6.53**			**6.53**
County Road 69 at T-C Canal to Saddle Dam Road	4.69			4.69
Saddle Dam Road to Saddle Dam 9	1.84			1.84
Peninsula Road	**1.47**			**1.47**
Sites Lodoga Road to Peninsula Hills Recreation Area (East Segment)	0.53			0.53
Sites Lodoga Road to Peninsula Hills Recreation Area (West Segment)	0.94			0.94
Saddle Dam Road	**3.17**			**3.17**
North Road to Saddle Dam 11	3.17			3.17
South Bridge			**1.57**	**1.57**
South Bridge			1.57	1.57
South Bridge East Approach		**0.28**		**0.28**
Stone Corral Road to South Bridge		0.28		0.28
South Bridge West Approach		**2.25**		**2.25**
South Bridge to Sites Lodoga Road		2.25		2.25
Stone Corral Road	**0.26**	**1.39**		**1.65**
Eastside Road to South Bridge East Approach		1.39		1.39
South Bridge East Approach to Stone Corral Recreation Area	0.26			0.26
Sulphur Gap Road	**4.85**			**4.85**
Lurline Road to Huffmaster Road	**4.85**			**4.85**
Private Access	**0.58**	**1.47**		**2.05**
Access Road	**0.58**	**1.47**		**2.05**
Eastside Road to bottom of Golden Gate Dam		0.26		0.26
Eastside Road to Sites Pumping/Generating Plant Electrical Switchyard		0.12		0.12
Eastside Road to Field Office Maintenance Yard		0.04		0.04

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Eastside Road to Sites Pumping Generating Plant		0.18		0.18
North Road to Saddle Dam 6	0.28			0.28
Saddle Dam Road to Saddle Dam 2	0.03			0.03
Saddle Dam Road to Saddle Dam 3	0.16			0.16
Saddle Dam Road to Saddle Dam 5	0.11			0.11
South Bridge East Approach to Inlet/Outlet Tower		0.11		0.11
South Bridge East Approach to top of Golden Gate Dam		0.75		0.75
Total	**35.02**	**9.48**	**1.57**	**46.07**

Notes:
Mi = miles
T-C Canal = Tehama-Colusa Canal

Table 3-4
Proposed South Bridge Characteristics

Item	Dimension
Bridge Length	Approximately 8,500 feet (1.6 miles)
Bridge Width	35.5 feet
Bridge Height[a]	Approximately 45 feet
Bridge Depth[b]	20 foot maximum, 8 foot minimum
Spans	400 feet maximum, 260 feet minimum, 22 spans total
Columns – 1.81 MAF Dimensions	18 feet by 14 feet square, hollow, maximum height approximately 300 feet, 21 columns total
Columns – 1.27 MAF Dimensions	18 feet by 14 feet square, hollow, maximum height approximately 260 feet, 21 columns total
Foundations	3-foot-diameter cast-in-place drilled shafts, 8 per footing, 168 total

[a]The bridge height is the distance from the top of the bridge deck to the maximum water surface elevation.
[b]The bridge depth is the distance from the top of the bridge deck to the bottom of the bridge structure that sits atop the columns.

Table 3-5
Characteristics of Proposed Minor Structures*

Item	Typical Dimensions
Culverts (over unnamed streams), 17 total	6 foot diameter by 100 foot length
Minor Bridge (over named streams), 1 total	40 foot width by 80 foot length

*Minor structures would be built using steel pipe or pre-cast pieces.

Construction. The total construction disturbance area would consist of approximately 1,330 acres. It would include the footprint of the proposed roads and stream crossings, the materials and equipment staging areas, the area needed to construct the facilities, and construction access roads. The total construction disturbance area would also include the footprint of the proposed South Bridge structure, the materials and equipment staging areas, the area needed to construct the facilities, and access roads.

Traffic that is not construction-related would be diverted around Project construction disturbance areas.

If necessary, an asphalt batch plant would be built on-site and outside of the proposed Sites Reservoir footprint. An asphalt batch plant footprint would occupy approximately 15 acres and would be located adjacent to the footprint of the proposed Field Office Maintenance Yard. This location would be centrally located to the proposed Project's paving needs, is relatively flat, and has shallow soils and impervious subsoil that should allow for easy spill containment and site cleanup. Alternatively, the construction contractor may obtain asphalt from regional commercial sources. Concrete bridge construction would include excavation for foundations and abutments; installing cast-in-place concrete formwork; placing reinforcing steel; installing bridge deck expansion joints; pouring and curing concrete; removing concrete forms; installing bridge barriers, bridge railings, bridge lighting, approach roadway guardrails, fences, signs, and reflectors; and painting approach and bridge deck striping.

Anticipated ground-disturbing activities during construction include:

- Surveying and marking
- Clearing and grading the construction workspace
- Preparing the construction materials laydown and equipment staging areas
- Transportation of materials and equipment to the project site
- Building concrete and/or asphalt batch plant
- Road cuts and fills
- Bridge foundation construction
- Bridge column construction
- Bridge span construction
- Installing culverts and minor bridges
- Laying aggregate road base and asphalt
- Installing fences, guardrails, and signs
- Installing roadway striping and reflectors
- Erosion and stormwater management
- BMP implementation
- Site restoration and clean-up

Operations. Not applicable.

Maintenance. Typical road maintenance would consist of chip sealing; patching; grading; crack filling; asphalt overlays; repairing damaged guardrails, fencing, and signage; embankment erosion repair; and vegetation control. Typical culvert and minor bridge maintenance would consist of debris removal, cleaning, and repairing steel pipe corrosion and pre-cast concrete cracks.

Typical bridge maintenance would consist of clearing debris from bridge deck and deck drainage outlets; barrier, railing and light repairs; concrete deck and expansion joint repairs; approach slab and guardrail repairs; and abutment erosion maintenance and repair. In addition, annual safety and maintenance inspections would be conducted pursuant to Caltrans/AASHTO requirements to maintain a bridge condition monitoring record.

3.1.1.4 Sites Pumping/Generating Plant

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill it and to generate electricity during the release of water from Sites Reservoir to Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The Sites Pumping/Generating Plant would lift water from Holthouse Reservoir into Sites Reservoir and would be connected to Holthouse Reservoir by a long excavated approach channel. The existing Funks Reservoir operates in coordination with the T-C Canal between elevations of 203 and 205 feet. However, with the proposed Holthouse Reservoir design which incorporates the existing Funks Reservoir, the Sites Pumping/Generating Plant would operate with tailwater elevations down to elevation 192 feet during pumping to take advantage of the full 6,500 acre-feet active capacity of Holthouse Reservoir. A 30-foot-diameter tunnel would be located on the inlet side of the Sites Pumping/Generating Plant connection to Sites Reservoir.

Water from Holthouse Reservoir would be drawn into the Sites Pumping/Generating Plant by the various pumping and pumping-generating units. The number of units operating would be selected to provide the approximate pumping capacity needed to deliver all water stored in the reservoir on a daily basis during the off-peak pumping period. The Sites Pumping/Generating Plant would be a conventional, indoor-type pumping-generating plant with an in-line arrangement of vertical pumping units. The Sites Pumping/Generating Plant for Alternatives A and C would have a total pumping capacity of approximately 5,900 cfs and a release capacity of 5,100 cfs. The Sites Pumping/Generating Plant for Alternative B would have a total pumping capacity of approximately 3,900 cfs and a release capacity of 5,100 cfs.

A Four Breaker Ring Bus would be required at the Sites Pumping/Generating Plant. The ring bus would be approximately 500 feet by 300 feet. The ring bus breaker would allow the electrical current flowing to each individual pump station to be isolated and interrupted, if required, for maintenance or safety without interrupting the current to the other pump stations.

Construction. Construction information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

Operations. Operations information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

Maintenance. Maintenance information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

3.1.1.5 Electrical Switchyards

Electrical switchyards would be needed to step down the electrical voltage from high voltage lines (used to transmit electricity over long distances) to a lower voltage that can be used by the pumps and other machinery in the proposed pumping/generating plants. An electrical switchyard would be constructed near where the proposed Delevan Transmission Line would cross an existing transmission line (either PG&E 230-kV, WAPA 500-kV, or WAPA 230-kV transmission lines that are aligned north-south); at the proposed Sites Pumping/Generating Plant; and at the proposed TRR Pumping/Generating Plant. The switchyard sites would be graded flat and would have multiple pieces of electrical equipment on concrete pads. The proposed Sites Electrical Switchyard associated with the Sites Pumping/Generating Plant would be approximately 3.5 acres in size. The proposed TRR Electrical Switchyard associated with the TRR Pumping/Generating Plant would be approximately 100 feet long by 50 feet wide. The proposed Holthouse Reservoir Electrical Switchyard or the Delevan Pipeline Electrical Switchyard associated with a transmission line tie-in to the existing WAPA Transmission Line or PG&E Transmission Line, respectively, would be approximately four acres in size. At each switchyard, one transmission tower (approximately 50 feet tall) would receive the electrical line entering the site. A four breaker ring bus would be required at each switchyard[2]. The ring bus would have multiple metallic poles with heights varying between 15 feet tall and 60 feet tall. The switchyards would be surrounded by a six- to eight-foot-high chain link fence with barb or serpentine wire along the top.

The switchyards and transmission lines connecting the pumping/generating plants to the grid would provide all of the electricity needed by the pumping plants. The switchyards and transmission lines would allow the pumping/generating plants to feed electricity back into the electrical grid during generation activities.

The proposed Sites Electrical Switchyard would be located north of and immediately adjacent to the proposed Sites Pumping/Generating Plant (Figure 3-4). The proposed Holthouse Reservoir Electrical Switchyard connecting to the existing WAPA or PG&E transmission lines would be located within the footprint of the existing Funks Reservoir facilities or within a portion of the surveyed footprint of Holthouse Reservoir (facility not shown in figure). The proposed TRR Electrical Switchyard would be located within the footprint of the TRR Pumping/Generating Plant (Figure 3-5). The proposed Delevan Pipeline Electrical Switchyard connecting to the existing PG&E transmission line would be located within the Delevan Pipeline right-of-way at the location where the source transmission lines cross the pipeline (Figure 3-5). No additional construction disturbance area would be required for this switchyard beyond what would be required for the Delevan Pipeline (discussed in Section 3.1.1.16).

Construction. The total construction disturbance area for the switchyards would include the footprint of each of the proposed switchyards, the materials and equipment staging area, electrical transformer area, and temporary access roads. The construction disturbance areas for the TRR-associated switchyard and the PG&E tie-in switchyard would be located within the Delevan Pipeline construction disturbance area. For the WAPA tie-in switchyard, the construction disturbance area would be located within Holthouse Reservoir Complex disturbance area. The construction disturbance area for the Sites Electrical Switchyard would be located within the Sites Reservoir Inlet/Outlet Structure disturbance area.

Anticipated major construction activities include clearing and grading the construction workspace; placing necessary construction materials at staging areas; and preparing the switchyard pad.

Operations. Operation of the proposed switchyards would be done remotely.

Maintenance. The proposed switchyards and transmission lines would require maintenance once or twice a year. Maintenance activities may include annual washing and cleaning of insulating equipment, preventative maintenance, scans of the switchyard under full load and routinely scheduled testing to meet Western Electricity Coordinating Council (WECC) requirements. Regular maintenance activities would include inspections for damage done by animals and maintaining landscaping.

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[2] The ring bus breaker would allow the electrical current flowing to each individual pump station to be isolated and interrupted, if required, for maintenance or safety without interrupting the electrical current to the other pump stations.

3.1.1.6 Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure

The purpose of the proposed tunnel is to transport water between the proposed Sites Pumping/Generating Plant and the proposed Sites Reservoir Inlet/Outlet Structure. The tunnel alignment would be located west of the existing Funks Reservoir and south of the proposed Golden Gate Dam on Funks Creek. The tunnel alignment would fall between the proposed Sites Pumping/Generating Plant location and the proposed Sites Reservoir Inlet/Outlet Structure location, and would be approximately 4,030 feet long (Figure 3-4).

The proposed 30-foot-diameter tunnel size is designed to meet DWR's Division of Safety of Dams' (DSOD) emergency drawdown release criteria. The tunnel would have a maximum discharge capacity of 23,000 cfs with a corresponding tunnel velocity of 32.5 feet per second (fps). Pumping velocities through the tunnel would be approximately 8.35 fps for the 5,900-cfs pumping plant included as part of Alternative A and Alternative C, and 5.51 fps for the 3,900-cfs plant included as part of Alternative B.

The tunnel from the upstream portal would be concrete-lined to prevent rock fallout and to ensure a smooth interior surface, thus reducing head loss and minimizing seepage into the surrounding rock. The tunnel would extend from the inlet to a vertical gate shaft with a fixed wheel gate. Downstream of the gate shaft, the tunnel would continue until the depth of rock cover dictates use of a steel liner. The tunnel would be concrete lined with an additional steel liner in the first 1,000 feet adjacent to the pumping plant.

Construction. The total construction disturbance area would be approximately 3.4 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. There would be no permanent aboveground disturbance area for this facility.

Anticipated ground-disturbing activities during construction include surveying and marking, clearing and grading, building access roads, installing temporary power to site, developing staging and material laydown areas, transporting construction materials and equipment to site, cofferdam and diversion construction at Golden Gate Dam, tunnel excavation, dewatering, concrete and steel liner installation, and site restoration and cleanup.

Operations. The typical operation scenario for the proposed tunnel would be 24 hours per day, seven days per week. Tunnel operation would be conducted remotely. The tunnel would transport flows between the proposed multi-level Sites Reservoir Inlet/Outlet Structure upstream and the Sites Pumping/Generating Plant downstream. During emergency release operations, the tunnel could discharge a maximum flow rate of approximately 23,000 cfs.

Maintenance. Maintenance would likely occur on an annual basis in coordination with maintenance and inspection of the proposed Sites Reservoir Inlet/Outlet Structure and multi-level intake tower upstream, and the proposed Sites Pumping/Generating Plant downstream.

To allow for tunnel inspection maintenance, low-level gate stop logs would be used to shut off flow from the low-level inlet structure to the downstream tunnel section. The stop logs would be lowered from a barge above and dropped into the low-level inlet structure. In addition, the multi-level tower wheel gates would be closed off to completely isolate the tunnel from reservoir flows for inspection and maintenance.

Typical tunnel inspection and maintenance may consist of checking for concrete cracks and leaks and missing or defective steel lining connections (bolts, rivets) at joints between lining sections and around connections with the Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure tower gates, and low-level intake structure.

3.1.1.7 Sites Reservoir Inlet/Outlet Structure

The purpose of the proposed Sites Reservoir Inlet/Outlet Structure would be to regulate proposed Sites Reservoir releases through the proposed tunnel to the proposed Sites Pumping/Generating Plant. The structure would be located on the west end of the tunnel and southwest of the proposed Golden Gate Dam (Figure 3-4). The structure would consist of a low level inlet/outlet structure for emergency drawdown releases, a multi-level inlet/outlet tower with two fixed wheel gates, and a tower access bridge.

The low level inlet/outlet structure would be approximately 120 feet from bottom of foundation to the top of trashracks. The rectangular structure dimensions would be approximately 100 feet by 120 feet. The three 30-foot by 30-foot intake openings would be covered by trashracks.

The multi-level inlet/outlet tower would have multiple inlet ports with the capability of drawing water at different levels in the reservoir, and trashracks with port valves (butterfly valves) embedded in the inlet tower tiers with four valves around each tier. The tower would also contain movable fish screens around two tiers for varied operational purposes (6,000 cfs for two tiers). Each port valve could be operated independently or all valves could be operated together in each tier. The tiers would be spaced approximately 20 feet apart down the tower beginning approximately 30 feet below the maximum reservoir water level. The high inlet tower/shaft would also contain two 9-foot by 35-foot fixed wheel gates at the base of the tower to isolate the tower from the main tunnel for inspection and maintenance. The main tower shaft would have an inner diameter of 30 feet and an outer diameter of 39 feet. Cranes would be used to hoist the fish screens, port valves, and gates for necessary inspection and maintenance.

The tower details would be similar for both the proposed 1.27 and 1.81 MAF Sites Reservoir sizes, but the tower elevations and number of inlet ports would be different. Table 3-6 provides a comparison of tower details for the two reservoir sizes under consideration.

Table 3-6
Proposed Sites Reservoir Inlet/Outlet Structure Tower Consideration

	1.81-MAF Reservoir Alternative B and Alternative C	1.27-MAF Reservoir Alternative A
Top Elevation	580.0 Feet	540.0 Feet
Bottom Elevation (Top of Bench)	320.0 Feet	320.0 Feet
Inside Diameter	30 Feet	30 Feet
Outside Diameter	39 Feet	39 Feet
Number of Ports	36 (4 Each at 9 Levels)	28 (4 Each at 7 Levels)
Functional Reservoir Release Elevations	520 Feet to 340 Feet	480 Feet to 340 Feet

A bridge would provide access to the multi-level tower from the nearby access road. The bridge length would be approximately 440 feet for the 1.27-MAF Sites Reservoir (Alternative A) and 540 feet for the 1.81-MAF Sites Reservoir (Alternatives B and C). The bridge deck elevation would be approximately equal to the dam crest heights (approximately 500 feet for the 1.27-MAF reservoir and 540 feet for the 1.81-MAF reservoir). The bridge is expected to be a simple welded-plate girder system with a lightweight concrete deck. The girders would be supported by the multi-level inlet/outlet tower, cast-in-place reinforced concrete piers, and a reinforced concrete abutment.

To meet DWR's DSOD's requirements, an emergency release outlet would be constructed to allow water levels behind the dam to be lowered quickly if the integrity of the dam is at risk. The 30-foot diameter tunnel with a maximum release capacity of 23,000 cfs is designed to meet DSOD's emergency drawdown release criteria. The emergency release would bypass the pump/generator units by passing water through an alternate outlet manifold (called the Emergency Release Bypass Outlet). The Emergency Release Bypass Outlet would be a 26-foot-diameter pipe that splits off from the tunnel/main inlet-outlet manifold. The 26-foot-diameter pipe would split into two 18-foot-diameter pipes, then into four 13-foot-diameter pipes, then into eight 9-foot-diameter pipes that would terminate at fixed cone valves. An Emergency Notification Plan would be developed, and would include a protocol for notifying downstream entities if an emergency release were to occur.

Construction. The total construction disturbance area would be approximately 110 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads.

Anticipated ground-disturbing activities during construction include surveying and marking, clearing and grading, building access roads, installing temporary power to the site, preparing materials laydown and equipment staging areas, transporting construction materials and equipment to the site, tower shaft excavation (separate from tunnel), dewatering, building the multi-level tower base and deck, building the access bridge to the multi-level tower, installing cranes on the tower deck, building the low-level intake structure, and finished grading and site clearing.

Operations. The proposed multi-level inlet/outlet tower and low-level intake structure would be operated remotely. The multi-level tower port valves could be operated independently or by tier. Port valve operations could be adjusted locally or remotely via a supervisory control and data acquisition (SCADA) system. Port valve operations would be changed by adjusting the hydraulic operators.

Maintenance. The stop gates could be raised and lowered between tiers to stop flow by tier if a port valve needed to be cut off from flow for inspection or maintenance. The gates could be raised or lowered by crane on-site or remotely via a SCADA system. Typical maintenance of the proposed inlet/outlet structure is expected to occur annually, and would consist of servicing the hydraulic equipment (hoist cranes, control motors) and fish screen pumps. Hydraulic equipment maintenance service would primarily involve lube and filter replacements.

The emergency stop gate maintenance would be performed annually. Maintenance would involve moving them through a full stroke (open and closed) position. Annual inspections for corrosion and wear would also be performed.

As part of emergency preparedness checks, the gate operation electrical control panel would be tested every six months.

The port valve hydraulic operators are very high maintenance items requiring quarterly inspection and maintenance. Typical port valve maintenance would involve lube and filter replacements along with checking for hydraulic line damage.

The concrete low-level intake structure is considered to be low-maintenance given it has no mechanical component and would be underwater. Annual maintenance typically would occur along with annual tunnel and tower inspections and maintenance. With the stop logs in place (normal operation), typical maintenance would include inspections for excessive leaking and cracks around the connection with the tunnel portal.

3.1.1.8 Field Office Maintenance Yard

Due to the size of the proposed Project area and the number of proposed facilities, a staffed operation and maintenance complex (Field Office Maintenance Yard) would be built on-site (Figure 3-4) to service all proposed Project facilities. An administration building and parking area would be constructed to meet Project needs.

Construction. The total construction disturbance area would be approximately 18 acres, with approximately 12 acres of permanent space for the proposed footprints of the administrative and maintenance buildings. Buildings may include an Administration Building, Plant Maintenance Warehouse, Service and Supply Warehouse, Utility Craft Office, Mechanical Equipment Shop, Heavy Equipment Shop, Project Surveillance Building, and General Maintenance Headquarters.

Construction of the proposed Field Office Maintenance Yard would include the following:

- Transportation of materials to the project site
- Clearing and grading the site for construction
- Placing construction materials at staging areas
- Constructing Administrative and Maintenance buildings
- Constructing ancillary facilities (e.g., leach-field, water treatment, incinerator, lighting, concrete pad for refueling island, aboveground fuel tanks, perimeter fencing)
- Site restoration after construction is complete

Operations. The typical operations scenario for the proposed Field Office Maintenance Yard would be 24 hours per day, seven days per week. The facility would be fully staffed during normal business hours, when scheduled maintenance of Project facilities would occur. Minimum personnel staffing would occur during off-peak hours to respond to emergency situations. Spare parts for mechanical and electrical equipment would be stored in the warehouse along with lubricants, oils, and greases to maintain equipment. Daily operations could include personnel traveling from the Field Office Maintenance Yard to Project facilities and performing scheduled repairs, inspection, and maintenance of Project equipment, observing Project facilities and operations, and as-needed emergency repairs. Equipment repair and overhaul (e.g., pumps, turbines) may take place at the facility. The SCADA system would be operated and monitored remotely from the Administration Building.

Daily operations may include fueling and washing vehicles and equipment, gathering technical data on water quality and project facilities conditions, and maintaining and repairing mechanical equipment.

Maintenance. Periodic maintenance would likely be performed on an as-needed basis including road, building, vegetation, and fence maintenance, as well as debris removal.

3.1.1.9 Holthouse Reservoir Complex

The existing 40-foot-high Funks Dam forms the 2,250 acre-foot Funks Reservoir one mile downstream of the proposed Golden Gate Dam site. This reservoir was constructed by Reclamation and is part of the T-C Canal system. Funks Reservoir serves as a re-regulating reservoir to stabilize flows in the canal downstream of Funks Reservoir as diverters come on line and off line. The existing Funks Reservoir would be expanded to form the proposed Holthouse Reservoir (Figure 3-4) by constructing a new dam

(Holthouse Dam) and reservoir to the east of Funks Reservoir, and breaching the existing Funks Dam so that the new and existing reservoirs would act as one unit with an enlarged active storage capacity of approximately 6,500 acre-feet and a surface area of approximately 450 acres. The proposed Holthouse Reservoir is required to facilitate balancing and regulating the proposed Sites Reservoir inflows and outflows through the proposed Sites Pumping/Generating Plant, and to provide sufficient supplemental storage to allow simultaneous pump back power generation.

The 6,500 acre-foot Holthouse Reservoir would allow the Sites Pumping/Generating Plant to perform a pumped-storage function for up to six hours per day while simultaneously collecting and storing inflows from the Sacramento River through the T-C and GCID canals (all three alternatives), and through the proposed Delevan Pipeline (Alternatives A and C). All water would be pumped into Sites Reservoir from Holthouse Reservoir during off-peak power periods on a daily basis.

The proposed Holthouse Dam would include two sections: a combination concrete and roller compacted concrete (RCC) dam section near the center that would accommodate the inlet/outlet facilities for the proposed Delevan and TRR pipelines, and earth embankments on either side of the concrete dam to close off the valley and form Holthouse Reservoir. The total length of the dam would be approximately 7,800 feet. The RCC dam section would be approximately 400 feet long. Maximum dam heights would be approximately 45 feet. The crest elevation of the dam would be at elevation 214 feet to match the crest of the existing Funks Reservoir Dam and the surrounding topography. A grout curtain would be installed under both dam sections to control underseepage.

Operating levels within Holthouse Reservoir would vary between elevation 206.0 feet and 192.0 feet, which would provide the required active storage capacity of approximately 6,500 acre-feet. Elevation 206.0 feet corresponds to the 2011 normal operating level in existing Funks Reservoir. There would be approximately 1,000 acre-feet of dead storage in Holthouse Reservoir due to topographic elevations near the new Holthouse Dam. This space could be allocated to sediment accumulation, disposal of excess excavated material from the proposed Project, or for disposal of existing sediment.

Pump-back operations would involve the daily procurement of relatively inexpensive power sources (i.e. renewable energy) to pump water from the proposed Holthouse Reservoir up to the proposed Sites Reservoir during off-peak hours of power usage, and release that pumped water from Sites Reservoir to Holthouse Reservoir during peak hours of power usage. Pump-back power production provides flexible generation and would be used to compensate for rapid changes in electric power demand, such as from increased air conditioning use on very hot days, as well as to compensate for changes in power production from variable renewable power sources, such as wind and solar power projects. Although water delivery and power production are given equal weight in the planning goals for the Project, pump-back power operations would likely be secondary to water delivery operations because of the various restrictions on water operations from contracts and from environmental restrictions, but would be optimized within those restrictions to produce the greatest value to users. Pump-back operations from the afterbay to the forebay of each of the two or three (depending upon the chosen alternative) proposed Project pumping/generating facilities would be possible, but only the Sites Pumping/Generating Plant would be used for daily pump-back operations because of the operational limitations placed on the smaller forebays and afterbays of the other Project pumping/generating facilities.

Besides the dam and reservoir, the Holthouse Reservoir Complex would also include the following features:

- **Holthouse Pumping Plant –** The reservoir operating levels could drop down below elevation 198.0 feet, which is the minimum level that could supply water to the downstream T-C Canal by gravity. To supply water to the canal when reservoir elevations are below 198.0 feet, a low head pumping plant would be installed with a capacity of 800 cfs. The pumps would draw water from the inlet/outlet piping. The water would be pumped up to the canal in a buried pipeline (the Holthouse to T-C Canal Pipeline) outside of the downstream toe of the dam. The pipeline would be a single 10-foot-diameter pipe or two 7-foot-diameter pipes. An energy dissipating structure would be provided at the discharge point to the canal.
- **Holthouse Spillway and Stilling Basin and Spillway Bridge –** An emergency spillway with a capacity of 23,000 cfs would be required in the Dam to pass the emergency Sites Reservoir drawdown flows required by DWR's DSOD. The stair-step RCC spillway with confining walls on both sides would be constructed near the center of the RCC dam. The spillway crest length would be approximately 375 feet and the crest would be set at an elevation of 206 feet, which corresponds to the current normal maximum operating level in Funks Reservoir. When passing the maximum design flow, the water depth over the spillway would be approximately seven feet. A stilling basin would be built below the spillway to dissipate the energy of the flowing water from the spillway to prevent erosion downstream of the dam. A 375-foot-long bridge would be built over the spillway to provide access across the dam.
- **Western Area Power Administration Transmission Line Relocation –** Eight Western Area Power Administration (WAPA) transmission line towers are located within the footprint of the proposed Holthouse Reservoir. Based upon preliminary contacts with WAPA, the preferred relocation alternative is one that would move a segment of the line to the west so that it would cross at a narrow spot in the existing Funks Reservoir. The relocated span would be approximately 1,000 feet.
- **Sites Pumping/Generating Plant Approach Channel –** The Sites Pumping/Generating Plant would be connected to Holthouse Reservoir by an earthern approach channel approximately 8,300 feet long. The Channel is expected to have relatively flat slope toward the Sites Pumping/Generating Plant and would be constructed at an elevation below the operating range of the reservoir. The Channel would have a trapezoidal geometry with a bottom width of approximately 200 feet and a top width of 400 to 700 feet. When Holthouse Reservoir is full, the channel would be nearly entirely submerged. This channel would allow water from Holthouse Reservoir to flow by gravity to or from the pumping/generating plant, and would allow upstream Funks Creek flows to enter Holthouse Reservoir via an approach channel spillway.
- **Existing T-C Canal Connections –** The T-C Canal would be modified to enter the Holthouse Reservoir at a point behind the Holthouse Dam. A new baffle block energy dissipating spillway structure (T-C Canal Discharge Dissipater) would be constructed near Holthouse Dam to convey water down into the reservoir regardless of reservoir level. Approximately 0.5 mile of the existing canal beyond the new tie-in point up to the current connection point to Funks Reservoir would be abandoned. A portion of the downstream canal within the Holthouse Reservoir limits would also be abandoned. Because it would be possible to supply water to the downstream canal by gravity at times when the Holthouse Reservoir is high, a new gate-controlled outlet would be provided from the reservoir near the abutment of the Holthouse Dam.

- **T-C Canal Construction Bypass Pipeline –** Installation of a bypass would be required to divert T-C Canal flow before starting modifications to existing Funks Reservoir. The bypass would be maintained as a permanent feature following modification of Funks Reservoir and construction of Holthouse Reservoir, as requested by TCCA. The proposed bypass would consist of a 12-foot-diameter pipeline starting approximately 2,600 feet upstream of the T-C Canal inlet into Funks Reservoir. The bypass would route the required flows around Funks Reservoir during reservoir modification construction. The bypass construction would require installation of two cofferdams on the upstream portions of the T-C Canal to isolate the area of embankment cut and pipe installation. The Funks Reservoir would be dewatered and the existing check structure would be dismantled and reconstructed approximately 3,000 feet upstream. The check structure would consist of two 18-foot by 15.5-foot gates, electrical control, hoists, and concrete supports and reinforcement. The facility would be relocated slightly downstream of the bypass. The bypass would need to be gated or valve controlled to regulate releases downstream, as required by the TCCA.

Construction. The total construction disturbance area would consist of approximately 640 acres. It would include the proposed footprints of Holthouse Reservoir, Holthouse Dam, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, T-C Canal Construction Bypass Pipeline, the Holthouse to T-C Canal Pipeline, and buffer lands adequate for construction staging.

Construction materials for the earth dam would come from required excavations for the proposed Sites Pumping/Generating Plant and the channel connecting the enlarged reservoir with the Sites Pumping/Generating Plant. The material in the existing Funks Dam could also be reused to construct the new dam. Approximately 680,000 cubic yards of core material and 2,200,000 cubic yards of earth and rockfill would be required to construct the dam.

Construction materials for the proposed Holthouse Dam would include imported sands and gravel. Processed rock from Project excavations could also be used if the material is found to be suitable for such use. On-site material sources would be explored in future investigations for the Project. Approximately 150,000 cubic yards of RCC material would be required.

Because the existing Funks Reservoir is an on-stream reservoir, a significant portion of the reservoir active storage has been displaced due to sediment accumulation from Funks Creek. Although topographic data are available for the reservoir from the original construction drawings, there is no current bathymetric data to support an estimate of the amount of sedimentation that has actually accumulated. However, it is believed that the current active capacity could be as low as 1,500 acre-feet. This would mean that approximately 750 acre-feet, or 1.2 million loose cubic yards of sediment has accumulated. A bathymetric survey of the existing reservoir would be performed as part of future design phases of the proposed Project to establish the volume and physical characteristics of the sediment so the material can be properly managed during design and construction.

A large portion of the accumulated sediment would be removed and relocated to construct the new Holthouse Reservoir, in particular the low level flow channel connecting the reservoir with the Sites Reservoir Pumping/Generating Plant. Once a diversion system is installed to route Funks Creek flows around the Holthouse Reservoir work site, the sediment can be dewatered over a period of time by ditching and sumping. Once dry enough to be excavated and moved, the material can be disposed of in the lower elevations of the new Holthouse Reservoir in a dead storage area or in backwater areas around the perimeter of the existing reservoir. The construction schedule for the proposed Project should allow adequate time to dewater and remove the material without affecting the new dam construction (which is outside the limits of sediment accumulation).

Typical summer releases from Funks Reservoir range from 500 cfs to 800 cfs. Total flows of 50 cfs to 200 cfs for off-peak limited agricultural releases would be needed between November and February, possibly stretching to March, depending on the weather. The proposed bypass consists of a 12-foot-diameter pipeline starting approximately 2,600 feet upstream of the T-C Canal inlet into Funks Reservoir. The bypass would route the required flows around Funks Reservoir during reservoir modification construction.

Operations. Funks Reservoir is operated by TCCA pursuant to a contract with Reclamation. Operation of the proposed Holthouse Reservoir would be coordinated with TCCA, but operated by the designated operator of the proposed Sites Reservoir. During fall and winter months, inflows from the conveyance system and water for power generation would be stored during on-peak power periods. The stored water plus ongoing off-peak inflows from the conveyance systems would then be pumped to Sites Reservoir during the partial-peak/off-peak power period on a daily basis. During the spring and summer months when releases are being made from Sites Reservoir, released water would go through the Sites Pumping/Generating Plant to generate power. Holthouse Dam would maintain releases to Funks Creek of up to 10 cfs year-round based on a recommendation from CDFW staff. This flow is intended to replace the existing seepage flow on Funks Creek below Funks Dam.

Maintenance. Current periodic maintenance required for Funks Reservoir includes road, vegetation, and fence maintenance, as well as debris removal, on an as-needed basis. The reservoir is also drained annually. These maintenance activities are expected to be the same for the proposed Holthouse Reservoir. Periodic maintenance and inspection of Holthouse Reservoir would be coordinated with T-C Canal operators or could be conducted at a centralized maintenance and operation office for the proposed Sites Reservoir.

3.1.1.10 Pump Installation at the Red Bluff Pumping Plant

The TCCA Fish Passage Improvement Project was constructed at the RBDD and completed in 2012. The Fish Passage Improvement Project (Figure 3-6) included a fish screen, a pumping plant at the Mill Site (known as the Red Bluff Pumping Plant), canal, siphon, a forebay, switchyard, and a bridge across Red Bank Creek. The fish screen structure was designed to meet National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA Fisheries) and California Department of Fish and Wildlife (CDFW) criteria for diversion flows of 80 cfs to 2,500 cfs. The 2,500-cfs Red Bluff Pumping Plant includes 11 vertical axial-flow pumps. Nine of the 11 vertical axial-flow pumps (seven 250-cfs and two 125-cfs) were installed in the pumping plant, having a combined total rated capacity of 2,000 cfs. The pumping plant includes two additional pump bays designed for the future installation of two 250-cfs vertical axial-flow pumps.

The proposed Project would require pumping capacity that exceeds the existing total rated capacity of the Red Bluff Pumping Plant. Therefore, the installation of one additional 250-cfs vertical axial-flow pump into an existing concrete pump bay at the pumping plant would be required (Figure 3-6). The proposed Project also includes the operation and maintenance of the proposed additional pump. The proposed additional pump at the pumping plant would allow for a total diversion up to 2,160 cfs for each proposed Project alternative in winter and spring months, including up to 2,100 cfs for diversion to the proposed Sites Reservoir, and an additional 50 to 60 cfs for maintaining existing winter and spring flow operations of the T-C Canal.

Construction. Installation of the 250-cfs vertical axial flow pump unit would require the following major construction activities[3]:

- The pump unit bay includes an existing 84-inch diameter steel pipe embedded in the pumping plant back wall. The existing steel pipe includes a blind flange on the afterbay side of the pumping plant back wall to prevent water from draining back into the forebay. The blind flange would be removed and replaced with an 84-inch butterfly valve. A new 84-inch diameter flanged steel pipe spool (approximately three feet long) would be connected to the butterfly valve and terminate with a new 84-inch flap gate. Permanent supports would be required beneath the butterfly valve and flap gate.
- Dewatering of the afterbay would likely be required. Therefore, installation of the pump should be performed during the non-irrigation season to minimize interruptions to the irrigation delivery system. A mobile crane would be required to install the piping and appurtenances.
- Pumping plant unit bay stoplogs would be installed, using a mobile crane, to accommodate dewatering the pump bay.
- The pump bay would be inspected and all sediment would be removed. Access to the bottom floor of the pumping plant is provided at each bay via 4.5-foot by 7-foot access hatches and ladders.
- Roof hatches over the pump unit bay would be removed using a mobile crane.
- The pump would be installed in accordance with the pump manufacturer’s written installation instructions, including constructing the pump pedestal and connecting the pump discharge nozzle to the discharge pipe via a new flexible coupling.
- Electrical conductors and a SCADA system would be installed.

Operations. The Red Bluff Pumping Plant includes a control system to provide remote manual and remote auto control of pumps and associated appurtenances. The pumping plant and associated gravity conveyance system are designed to deliver water to the existing 17-acre settling basin located to the west of the RBDD. Once in the settling basin, water would flow to Check No. 1 on the T-C Canal and the Corning Pumping Plant.

Maintenance. It is anticipated that the following basic preventative measures would be undertaken on a regular basis to maintain the vertical axial-flow pump and its appurtenances that would be installed as part of the proposed Project. These activities would occur as part of the regular maintenance activities for the Red Bluff Pumping Plant:

- Wash down or pressure wash, as necessary
- Check for rust/corrosion, annually; maintain all coatings
- Visually inspect for damage or wear, monthly
- Assess fluids and lubrication; address as necessary
- Inspect pumping plant trashracks daily and remove debris as necessary
- Visually inspect butterfly valves and flap gates, monthly

The proposed additional Project pump would not increase the frequency of maintenance activities required at the pumping plant, nor would it require additional personnel to perform pump maintenance. However, the volume and timing of non-TCCA water diversions, through any of the pumps, could impact

[3] A formal work plan that describes all construction activities would be required prior to the start of construction.

the sediment load distributed to the TCCA system (i.e., the pumping plant forebay and settling basin). Increased sedimentation associated with non-TCCA water diversions may require more frequent dredging within the pumping plant forebay than prior to the Project pump's installation and operation.

3.1.1.11 GCID Canal Facilities Modifications

The GCID Canal is an existing irrigation canal that delivers water from the Sacramento River to water users along its route from its diversion point northwest of Hamilton City to southeast of the City of Williams. The canal is an unlined earthen channel, with capacity varying from 3,000 cfs at the upstream end to 300 cfs at the southern terminus.

The existing canal facilities divert water from the Sacramento River into a forebay where the water is pumped by the Main Pump Station into the GCID Canal. The existing canal facilities include the intake and bypass channels, fish screens, main pump station and forebay, headgates, gradient facility, and the GCID Canal. These facilities are located approximately five miles northwest of Hamilton City. Proposed Project improvements in this area include a new headgate structure and canal lining. A railroad siphon replacement is also proposed near the City of Willows.

For the proposed Project, the existing headgate structure would be left in place to continue to serve as a bridge between County Road 203 and County Road 205. The existing headgate structure would continue to operate during construction of the new headgate structure, and diversion activities would continue throughout construction. The existing headgate would not be adequate for proposed winter season Project operation during high-river flows due to the large head-drop across the structure during high river level conditions. A new headgate structure would be constructed upstream of the existing structure. The new headgate structure would include three automated gates (two vertical roller gates and one radial gate). The new headgate structure would provide the following three main operations:

- Isolate the Main Canal, as needed, for repairs or other purposes, such as the canal reach between the Main Pump Station and Stony Creek, to prevent local flooding during high river levels.
- Control flow when the headworks are under gravity inflow conditions and the pumping plant is shut down, which occur during high river levels.
- Control water elevations downstream of the existing headworks, as necessary, to extend their operating range under higher river levels.

Design consideration for the new headgate includes:

- The structure's invert and crest would be based on matching the existing canal invert and top of bank elevations, respectively.
- The relatively deep channel section in this reach of the canal would result in a structure that is over 30 feet high.
- The design condition for this structure, for sliding and over-turning stability, would occur with maximum water levels on the upstream side (during high river levels), and a drained canal on the downstream side (for emergency shutdown).

The water level and flow control functions would involve operating conditions that would result in water surface drops across the headgate of between three and 15 feet, which would require a set of energy dissipater blocks immediately below the gates to slow down and stabilize the water discharging under each gate.

The canal reach immediately downstream of the new headgate structure would be lined with concrete for approximately 200 feet to prevent erosion due to the turbulent flow conditions.

The Union Pacific Railroad Siphon at Mile 26.6 does not meet design and operation criteria for the proposed Project and would need to be replaced. The existing Railroad Siphon structure was built in the early 1900s and includes two 6-foot-diameter barrels and five 7.25-foot by 6-foot barrels. At maximum existing flows of approximately 2,000 cfs, the head loss across the Railroad Siphon, due to high flow velocity and poor entrance and exit transitions, reduces upstream canal freeboard to very marginal conditions. Based on the structure’s age, hydraulic capacity restrictions, and use as a major transportation link, it should be replaced. The new structure would consist of three prefabricated box culverts. Typical future maximum velocity and head losses would be approximately four fps and 0.2 foot, respectively.

The proposed replacement of the Railroad Siphon would require coordination and planning with railroad operators. Construction restrictions may exist regarding minimizing interference with regular railroad operations. To the extent possible, replacement of the Railroad Siphon would take place during periods of lowest train traffic and railroad shutdown time would be minimized.

Construction. The total construction disturbance area would consist of approximately five acres. It would consist of the existing canal prism, existing operation and maintenance roads, and an additional 50 feet on both sides. The total construction disturbance area would include the footprint of the proposed facilities (new headgate structure, canal lining, and replacement of Railroad Siphon), the materials and equipment staging area, the area needed to construct the facilities, and access roads. All of the construction activities for the new facilities would occur within the existing GCID right-of-way.

Water delivery to the GCID service area would be maintained during the primary irrigation season (early April through mid-October). The GCID Canal is typically out of service each year between January 7th and February 20th for maintenance. Construction activities would be scheduled during this maintenance period whenever possible. If construction activities are required outside of the maintenance period, a temporary bypass channel would be built around the construction site to allow diversion water to flow past and maintain regular canal operation. The temporary bypass channel would be constructed within the existing GCID right-of-way using a combination of excavation, earth embankment, and sheetpile walls to isolate the construction site from the canal. After completion of construction, the temporary bypass would be filled in, earth embankments and sheetpile walls would be removed, and the area would be restored to pre-construction conditions.

Operations. The intake and fish screen facility would operate year-round and would be very similar to existing operations.

GCID is currently adding the SCADA system to the existing GCID Canal system. The new proposed GCID Canal facilities for the proposed Project may need to be incorporated into GCID’s SCADA system. The design of new systems would be coordinated with GCID to ensure proper integration.

Use of the canal for conveyance to the proposed Sites Reservoir would require increased automation between the GCID facilities and other proposed Project conveyance systems. The available capacity for winter season operation (October through March) of Project conveyance would range from a minimum of approximately 1,270 cfs during an average November to a maximum of approximately 1,750 cfs during an average March. There is currently little to no available capacity from April through September. To accommodate the proposed Project flow, flows need to be monitored and controlled consistently. SCADA operations and monitoring could be done remotely and would not require the presence of daily on-site personnel. Instead, daily operation and monitoring would be managed from a central location and would not require additional staff beyond existing personnel.

Maintenance. Required maintenance activities would be very similar to current maintenance. Periodic inspection and maintenance of mechanical systems, such as the screen cleaning system, would be required. Water level monitoring would continue to be done automatically. Additional sediment and debris removal activities may also be required due to increased diversions during high river water levels.

Debris that enters the intake channel, such as large floating trees, can block flows in the channel, get entangled at the face of the fish screen, block the water control structure, or cause other disruptions to proper operating conditions. Typically, the debris builds up during winter season flood flows and is removed at the beginning of the irrigation season in late March to early April. Because of wintertime diversions, a larger debris load is expected at the intake channel, screen structure, and bypass channel. It is expected that debris removal would be required during the winter season to maintain proper operating conditions. It may be necessary to retrofit the mouth of the intake channel with a floating log boom to deflect larger debris and provide increased protection to the fish screens.

The upper one-third of the intake channel is typically dredged once every three years and the entire channel is dredged once every 10 years. The volume of the dredged materials varies from approximately 30,000 to 130,000 cubic yards. The future volume of sediment in the intake channel is expected to increase with increased Project-related wintertime operation and the following assumptions were made regarding future dredging operations:

- A larger dredge with increased capacity and working depth than is currently used would be required. Supporting equipment, such as a high-capacity crane equipped with a grappling hook and clamshell, would be required to assist in debris removal.
- Dredging operation would occur year-round.
- Because dredging would occur year-round, a new U.S. Army Corps of Engineers 404 permit would be needed to allow dredging during the winter season.

Dredged materials would continue to be placed on the 11-acre off-site disposal location to the southwest of the pump station, at sites on Montgomery Island, and along the canal banks.

The new headgate structure would require annual inspection and maintenance including painting and motor control unit inspections, similar to typical check structures along the canal.

Expected periodic maintenance activities for the canal that would require on-site personnel would include:

- Maintaining canal banks to repair sloughing and erosion damage
- Filling in animal burrow holes
- Removing vegetation
- Removing debris from upstream of the check structures
- Maintaining gate operators
- Repairing and repainting gates.

A dedicated maintenance period is required for the canal from January 7th through February 20th every year. During this maintenance period, the canal will be shut down.

3.1.1.12 GCID Canal Connection to the Terminal Regulating Reservoir

The purpose of the proposed connection from the GCID Canal to the TRR would be to reduce the velocity of flows from the GCID Canal to approximately 1 fps to form a stable pool. The stable pool would occur just before the turnout to the connecting channel to the proposed TRR.

The connection from the GCID Canal to the TRR would be located north of the proposed TRR Pipeline between the GCID Canal and the TRR, (Figure 3-5). It would have two features: (1) the GCID Canal energy dissipation bay with check structure, and (2) the TRR inlet channel and inlet control structure. The bay would be located along a reach of the GCID Canal approximately 500 feet long, with a 220-foot bottom width, 20-foot depth and embankment slopes of 1.5 to 1. On the east end of the bay, the reservoir inlet channel would divert flow to the TRR. On the south end of the bay, a new radial-gate check structure would serve two purposes: (1) maintain a water surface elevation in the canal transition section to provide available head for conveyance into the TRR and (2) control flow to the remaining downstream reach of the GCID Canal.

The inlet channel would connect the Main Canal to the TRR. The channel would be a lined trapezoidal cross-section, having a 70-foot bottom width and a length of 400 feet, with embankment slopes of 1.5 to 1. The inflow control structure would be very similar to a standard GCID Canal check structure, with three large radial gates to control flow into the TRR. The structure’s top deck width would accommodate vehicle traffic to allow access along the Canal. A transition apron (a large concrete pad) into the reservoir would be located immediately downstream of the control gates. The apron would be 160 feet wide and 100 feet long. The function of the concrete apron would be to provide an erosion-resistant area for energy dissipation as the water enters the TRR.

The earthen embankment for the inlet channel would be approximately 20 feet high. When the radial gates at the check structure open, the gates would be approximately 15 feet above the embankment.

Construction. The total construction disturbance area would consist of approximately seven acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. This construction disturbance area would be within the larger construction disturbance area for the proposed TRR.

Anticipated ground-disturbing activities during construction include:

- Transportation of materials to the proposed Project site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Dewatering and building a temporary bypass channel
- Excavation of canal energy dissipation bay
- Reservoir inlet excavation and embankment construction
- Construction of check structure

It is anticipated that the proposed reservoir inlet from the GCID Canal to the proposed TRR would be constructed by first building a temporary bypass channel to the west of the existing canal alignment. The temporary bypass channel would be approximately 1,000 feet long, and would connect into the GCID Canal upstream and downstream of the construction zone to supply water to the remaining reach of the

Canal downstream of the TRR area. The temporary bypass channel would be constructed using a combination of excavation, earth embankment, and sheetpile walls to isolate the construction site from the diversion canal. Following completion of the new check structure, the temporary bypass would be filled in, earth embankments and sheetpile walls would be removed, and the area would be restored to pre-construction conditions.

Operations. Gate operation of the new GCID Canal Check Structure would normally be controlled automatically, with an option for local or remote manual control. Gate operation would be established either using upstream or downstream water-level controls, depending on the overall operating regime for the future canal system.

Flow into the reservoir would be controlled by the proposed TRR inlet control gates. An integrated SCADA and communication system would be required to coordinate operations between the GCID Pump Station, GCID Canal, and the proposed TRR, TRR Pumping/Generating Plant, and Holthouse Reservoir. SCADA operation and monitoring would be done remotely and would not require the presence of daily on-site personnel. Instead daily operation and monitoring would be managed from a central location.

Maintenance. Maintenance activities would include (1) removing debris that could collect upstream of check structures, (2) maintaining gate operators to provide adequate control of gates, (3) periodically repairing and re-painting the connection, and (4) dredging the dissipation bay and inlet channel for sediment concurrently with the proposed TRR dredging.

3.1.1.13 Terminal Regulating Reservoir

Water conveyed down the GCID Canal would be directed into the proposed TRR (Figure 3-5). A new pump station (the proposed TRR Pumping/Generating Plant) would then convey the water from the TRR via the proposed TRR Pipeline to the proposed Holthouse Reservoir. The TRR would be required to provide operational storage for the TRR Pumping/Generating Plant to balance normal and emergency flow variations between the upstream GCID Canal Pump Station, the 40 miles of connecting canal, and the TRR Pumping/Generating Plant.

The TRR would be constructed on the valley floor adjacent to the GCID Canal by a combination of excavation and embankment. The TRR would be located approximately three miles northeast of Holthouse Reservoir. The TRR would be composed of an earth embankment dam, concrete emergency overflow weir, an outfall standpipe, and an approximately 4,000-foot-long underground 60-inch-diameter outlet pipe to Funks Creek (the TRR to Funks Creek Pipeline). The outlet pipe would be used, as necessary, to drain the reservoir for operation and maintenance and emergency purposes. A15-foot-wide gravel road (the proposed TRR Pipeline Road) would be constructed on top of the embankment to provide access to the facility for operation and maintenance.

The embankment materials would be impervious earthen material compacted to DWR’s DSOD standards. The 200-acre TRR would be approximately 15 feet deep with a maximum water depth of 12 feet, leaving three feet of freeboard. The maximum excavation depth of the TRR would be approximately nine feet, and the maximum embankment height would be approximately six feet above existing grade. The total storage volume in the TRR would be divided into three operational components: (1) two feet of dead storage beneath the lower operating limit of the pump station; (2) five feet of normal operational storage; and (3) five feet of emergency storage. The maximum water surface elevation in the TRR could not exceed the water surface elevation in the GCID Canal because it is a gravity flow system. The bottom dimensions of the TRR would be approximately 2,900 feet by 2,900 feet, and the reservoir would have a maximum storage capacity of 2,000 acre-feet. The TRR capacity is designed to provide normal operating and emergency storage as well as a forebay for the proposed TRR Pumping/Generating Plant.

Major appurtenance features would include a GCID Canal transition bay, a connecting channel from the GCID Canal to the TRR, and a flow control inlet structure.

Construction. The total construction disturbance area would consist of approximately 300 acres. The proposed TRR site is currently in agricultural production (including rice crops, annual row crops, and orchards). The total construction disturbance area would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. This staging area could be the same as, or nearby, the GCID Canal Connection staging area because the construction sites are located adjacent to each other. In addition, the portion of the proposed Delevan Pipeline construction disturbance area that would abut the TRR could also be used for the TRR staging area.

Anticipated major construction activities include transportation of materials to the proposed work site, clearing and grading the construction work space, staging of construction materials, dewatering, constructing fencing around the perimeter, constructing lighting, and excavation and embankment construction.

Operation. In coordination with GCID Canal operation, water would be diverted to the proposed TRR by gravity. Flow into the TRR would be controlled by the TRR inlet control gates. An integrated SCADA and communication system would coordinate operation between the Main Pump Station, GCID Canal, and the proposed TRR, TRR Pumping/Generating Plant, and Holthouse Reservoir. Flow to Holthouse Reservoir and the water surface in the TRR would be regulated by the TRR Pumping/Generating Plant. TRR pump operators would require continuous communication with GCID Main Pump Station and canal operators to coordinate water allocation for both irrigation demands and proposed Sites Reservoir delivery. This coordination would be simpler in the mid-winter season when there is low irrigation demand and most of the flow in the GCID Canal would be conveyed to the TRR. Coordinating water allocation may be more complex during the early to late spring in years when water would be diverted to Sites Reservoir because of high river flows, and irrigation demands increase. TRR operation would likely be controlled remotely and would not require the presence of daily on-site personnel. The reservoir would be designed to allow emergency releases during operation first to the GCID Canal via the GCID Canal Connection to the TRR (when hydrologically feasible), and then to Funks Creek via the proposed TRR to Funks Creek Pipeline. Release flows would be controlled by an energy dissipater and small concrete structure at the terminal end of the pipeline.

Maintenance. Typical maintenance of the proposed TRR would include dredging to remove sediment when it is drained, clearing vegetation from the slopes of the embankments, and maintaining the gravel service road atop the embankment. Draining the TRR for maintenance would be accomplished by a standpipe and drain structure at the invert of the reservoir. Drained water would be conveyed to Funks Creek via the proposed TRR to Funks Creek Pipeline. Draining/dredging of the TRR is likely to be required every seven to 10 years depending on variable sediment transport conditions in the Sacramento River and the surrounding areas. Sediment removed during the dredging activities would be placed on the surrounding levees' embankments.

3.1.1.14 TRR Pumping/Generating Plant

The purpose of the proposed TRR Pumping/Generating Plant would be to pump water from the proposed TRR to the proposed TRR Pipeline, which would convey water to the proposed Holthouse Reservoir. Return flows from the proposed Holthouse Reservoir to the proposed TRR would flow through the TRR Pumping/Generating Plant to generate power.

The TRR Pumping/Generating Plant would pump 1,800 cfs of water from the TRR to Holthouse Reservoir. The TRR Pumping/Generating Plant would generate power from flows released through it with a maximum return flow of 1,500 cfs. The minimum water elevation in Holthouse Reservoir for operation of the TRR Pumping/Generating Plant would be 112 feet, and its maximum water elevation for operation would be 121.5 feet.

The TRR Pumping/Generating Plant would be located adjacent to the TRR on the north side (Figure 3-5), and would be approximately three miles northeast of Holthouse Reservoir. On the north side of the TRR, the TRR Pumping/Generating Plant would connect to the TRR Pipeline. The TRR Pumping/Generating Plant would consist of two 620 cfs and two 325 cfs Francis Vane pumps for pumping and two 750 cfs Kaplan turbines for generating during release flows.

Structures associated with the TRR Pumping/Generating Plant would include the following:

- Mechanical Features
  - 84-inch online Spherical Valve on each discharge line.
  - Air Chambers and Butterfly Valves with Hydraulic Power Units.
  - Compressors
  - Generators
  - Gantry Crane – 100 tons
  - Service air and water system
  - Acoustical flowmeter on each discharge line
- Electrical Features
  - Switchyard Transformers
  - Control system
  - Switchgears
  - Grounding grids
  - Control cabinets
- Refilling Pump Units

The discharge lines may periodically need to be dewatered for inspection and maintenance. These lines would need to be filled at a slow rate to allow the release of air through air and vacuum valves. To accomplish this, one or two 100 cfs pump units would be installed.

Construction. The total construction disturbance area would consist of approximately one acre, and would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. The construction disturbance area would fall within the construction disturbance area of the proposed TRR Pipeline (discussed in Section 3.1.1.15).

Excavation would be conducted using temporary slopes of 1.5:1 for the 25 feet deep trench along the pipelines, and a temporary slope of 2:1 for the 40 feet deep foundation of the pump stations. The pump station foundations would be excavated in in-situ materials and no major improvements to the foundations would be required. During construction, the topsoil material would be excavated, stockpiled separately, and replaced to ensure native grasses and plants would grow.

Anticipated ground-disturbing activities during construction include:

- Transportation of materials to the proposed Project site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Dewatering
- Excavating the forebay (approach channel) and pumping plant
- Construction of the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. An integrated SCADA and communication system would be used for the proposed TRR Pumping/Generating Plant. Flow to the proposed Holthouse Reservoir and the water surface in the proposed TRR would be regulated by the TRR Pumping/Generating Plant. TRR pump operators would require continuous communication with GCID Main Pump Station and canal operators to coordinate water allocation for both irrigation delivery and for proposed Sites Reservoir filling. This coordination would be simpler in the mid-winter season when most flows are conveyed only to the TRR for filling Sites Reservoir. Coordinating water allocation may be more complex during the early to late spring in years when water would be diverted to fill Sites Reservoir and delivered to meet irrigation demands.

Maintenance. Routine maintenance and monitoring would likely be required on a daily basis. Regular maintenance and inspection would have to be done for each pump unit and the related equipment, such as gates, valves, and electrical equipment, with possible additional inspections and maintenance needed after earthquakes or storm or flood events.

3.1.1.15 TRR Pipeline

The 3.5-mile-long proposed TRR Pipeline would convey water from the proposed TRR to the proposed Holthouse Reservoir (Figure 3-5). The TRR Pipeline would be bi-directional, allowing water to be pumped from the TRR to Holthouse Reservoir for storage, and allowing water to flow by gravity from Holthouse Reservoir for release to the TRR/GCID Canal. As water released from Holthouse Reservoir flows through the proposed TRR Pumping/Generating Plant at the end of the TRR Pipeline, it would pass through turbines to generate electricity.

The proposed TRR Pipeline would have a capacity of 1,800 cfs to convey water that is pumped from the TRR to Holthouse Reservoir. The capacity of the TRR Pipeline to convey water by gravity flow from Holthouse Reservoir to the TRR would be 1,500 cfs. The TRR Pipeline would consist of two 12-foot-diameter reinforced concrete pipes. It would be buried a minimum of 10 feet (to top of pipe) below the ground surface. Proposed facilities associated with the TRR Pipeline include blow-off structures and air valve structures.

The proposed alignment of the TRR Pipeline would cross the existing GCID Canal and a main Pacific Gas and Electric (PG&E) natural gas distribution line. At these locations, the bore and jack construction method would be used. Bore and jack construction would entail excavating a large pit on each side of the existing infrastructure (highway, railroad, or canal in this case) and then tunneling horizontally under the structure without disturbing it. Due to the high water table in the area, this construction method may require dewatering the area. All additional work required for bore and jack construction would be conducted within the construction disturbance area and would not require the disturbance of additional land.

The TRR Pipeline would also cross the easement of the existing PG&E 230-kV line. No permanent aboveground structures associated with the pipeline, other than a 16-foot wide, 2.1 mile-long gravel maintenance road (the proposed TRR Pipeline Road) from the GCID Canal to the proposed Holthouse Reservoir Spillway and Stilling Basin, would be constructed.

Other existing infrastructure that the TRR Pipeline could potentially cross include: gas lines, water lines, sewer lines, and communications lines. The bore and jack construction method would be used at these utility crossings. Disruptions to these utilities would be minimized to the extent possible, and the ground surface would be restored to pre-construction conditions after installation of the TRR Pipeline. Construction activities for the proposed TRR Pipeline would occur within the identified construction disturbance area and would require only slightly more excavation than is required for the pipeline.

Construction. The construction disturbance area for the proposed TRR Pipeline would be approximately 335 feet wide from the TRR to the proposed Holthouse Reservoir (3.5 miles). The total construction disturbance area, which would also include a temporary concrete batch plant, would fall within the construction disturbance area for the proposed Delevan Pipeline discussed in Section 3.1.1.16.

Anticipated major construction activities include:

- Clearing and grading the construction workspace
- Stockpiling topsoil
- Placing necessary construction materials at staging areas
- Transportation of materials to the Project site
- Trenching/excavation of pipeline route
- De-watering
- Bedding preparation
- On-site fabrication of pipe
- Installation of pipe and valves
- Crossings of roads and utilities
- Backfill and compaction of trench
- Replacement of topsoil
- Revegetation and restoration of pipeline route
- Construction of a gravel maintenance road

Operations. Operation of the proposed TRR Pipeline would not require daily workers at the site.

Maintenance. Periodic inspection and maintenance of the proposed TRR Pipeline would likely occur once per year, with possible additional inspections and maintenance needed after storm or flood events. Permanent rights-of-way for the land overlying the pipeline would be maintained to provide future access. The proposed gravel maintenance road would be graded, as needed.

3.1.1.16 Delevan Pipeline

The approximately 13.5-mile-long proposed Delevan Pipeline would convey water from the Sacramento River to the proposed Holthouse Reservoir to fill the proposed Sites Reservoir, and/or convey water from Holthouse Reservoir to the Sacramento River for releases (Figure 3-1). The Delevan Pipeline would parallel the proposed TRR Pipeline at its western end and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-5).

The Delevan Pipeline would have a 2,000 cfs capacity to convey water from the proposed Delevan Pipeline Intake Facilities (on the Sacramento River) to Holthouse Reservoir. The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. Because of the available head, releases through the Delevan Pipeline could be made to the river by gravity without the need for pumping. The Delevan Pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

From the Sacramento River, the Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would turn southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

Proposed facilities associated with the Delevan Pipeline include blow-off structures, air valve structures, and outlet and energy dissipater structure.

Alternatives A and C would include a bi-directional Delevan Pipeline; further details are provided in Section 3.1.4.4. Alternative B would include a release-only Delevan Pipeline; further details are provided in Section 3.1.5.3.

Construction. Construction information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

Operations. Operations information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

Maintenance. Maintenance information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

3.1.1.17 Project Buffer

The proposed Project Buffer (Figure 3-1) would consist of the total amount of land that would be acquired for the proposed Project beyond the facility footprints, out to the nearest existing parcel boundaries. The proposed Project Buffer would surround the proposed Sites Reservoir, Holthouse Reservoir Complex, and all proposed facilities located between these two facilities; the proposed TRR and associated facilities; and the proposed Delevan Pipeline Intake/Discharge facilities[4]. Because the intent of the Project Buffer is to create a “buffer” around proposed Project facilities, while following existing parcel boundaries, the width of the buffer around proposed Project facilities would vary. The Project Buffer would serve several purposes:

- It would avoid splitting parcels and rendering parcel remnants unusable by existing landowners.
- It would provide a buffer between proposed Project facilities and adjacent existing land uses to avoid potential conflicts in land uses.
- It would prevent shoreline development around the proposed Sites Reservoir.

[4] The proposed Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, and TRR Pipeline Road would not have an associated buffer. These proposed Project facilities would not require additional lands for long-term operation and maintenance. The Delevan and TRR pipelines would be underground features that would have periodic aboveground structures that include blow-off structures, air valve structures, and an outlet and energy dissipater structure. The TRR Pipeline Road would be located above the TRR Pipeline. The Delevan Transmission Line would result in aboveground development only at each transmission tower.

- It would prevent livestock access to the reservoirs, and prevent livestock wastes from entering the proposed reservoirs.

Construction. The lands within the proposed Project Buffer would remain undeveloped; the existing vegetation would be maintained as wildlife habitat and protected from fuelwood harvest, grazing, and other forms of environmental degradation. Existing structures would be demolished and the remaining land would be managed as wildlife habitat. Existing agricultural lands would not be maintained as agriculture but converted and managed as wildlife habitat.

The Project Buffer boundary would be fenced using standard three-strand barbed wire fences with posts, in areas where the parcels are not already fenced, so that the entire Project Buffer boundary would be fenced. A fuelbreak would be constructed around the perimeter of the Project Buffer.

Operations. Not applicable.

Maintenance. Maintenance activities that are proposed to be undertaken within the Project Buffer boundary include fence maintenance and periodic boundary fuelbreak maintenance.

3.1.2 Ecosystem Enhancement Actions

Ecosystem enhancement actions could be undertaken to support the increase fish survival NODOS Project objective. Based upon recommendations from federal and State fish agencies with regulatory authority over the project, Reclamation and DWR propose to provide two types of ecosystem enhancement actions: operational and nonoperational. Conceptually, the operational and non-operational actions might be most effective if implemented concurrently. The operational and nonoperational ecosystem enhancement actions are described in the following sections.

3.1.2.1 Ecosystem Enhancement Storage Account—Operational Actions

The proposed Project would provide a unique opportunity to create the first firm asset ecosystem enhancement storage account (EESA) in California managed by the State and/or the federal government and dedicated to restoration actions beyond regulatory requirements. As part of the CALFED Bay-Delta Program, the Ecosystem Restoration Program (ERP) developed an integrated systems approach based on reversing the fundamental causes of decline in fish and wildlife populations by recognizing the natural processes that created historic habitats and using these processes to help regenerate habitats. The ERP was not designed as mitigation for CALFED projects; instead, it was intended to fulfill the objectives of environmental stewardship and improving ecological processes and increasing the amount and quality of habitat, equal with other program goals related to water supply reliability, water quality, and levee system integrity.

The ERP identified over 600 programmatic actions to improve ecological health. The ERP advocated an adaptive management implementation strategy that supports the flexible use of environmental water. This adaptive approach has been accommodated in Project planning by dedicating proposed Project storage allocation to ERP objectives (an ERP pool or account), and then giving resource managers the ability to adjust priorities based on the monitoring of implemented actions, as well as potential new priorities. The NODOS Project planning team identified ERP objectives that could be supported by implementing a NODOS Project and prioritized actions with input from the Sacramento River Flow Regime Technical Advisory Group. This Technical Advisory Group included environmental advocacy groups, academics, and representatives from federal and California water resource and wildlife agencies (the Technical

Advisory Group is described in more detail in Chapter 36 Consultation and Coordination). The Technical Advisory Group met with the NODOS Project management team from 2002 through 2004. Ultimately, Reclamation and DWR adopted a list of objectives, including both tributary actions and Delta actions, which were incorporated into the proposed operations strategy for the NODOS Project action alternative plans:

- Improve the reliability of coldwater pool storage in Shasta Lake to increase Reclamation's operational flexibility to provide suitable water temperatures in the Sacramento River. This action would operationally translate into the increase of Shasta Lake storage levels in May, and increased coldwater pool in storage, with particular emphasis on Below Normal, Dry, and Critical water year types.
- Provide releases from Shasta Dam of appropriate water temperatures, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and lifestages of anadromous salmonids in the Sacramento River between Keswick Dam and RBDD, with particular emphasis on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types.
- Increase the availability of coldwater pool storage in Folsom Reservoir, by increasing May storage and coldwater pool storage, to allow Reclamation additional operational flexibility to provide suitable water temperatures in the lower American River. This action would utilize additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to maintain mean daily water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during all water year types.
- Stabilize flows in the lower American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce isolation events (specifically, flow increases to greater than or equal to 4,000 cfs with subsequent reduction to less than 4,000 cfs) of juvenile anadromous salmonids, particularly from October through June. Reduce the reliance upon Folsom Reservoir as a "real-time, first response facility" to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the lower American River.
- Provide supplemental Delta outflow during summer and fall months (i.e., May through December) to move X2 location westward, downstream of Collinsville (81 kilometers). X2 is the location of the 2 parts per thousand salinity contour (isohaline), one meter off the bottom of the estuary, as measured from the Golden Gate Bridge. The abundance of several estuarine species, such as delta smelt, longfin smelt, Sacramento splittail, and starry flounder has been correlated with X2 location. There is general consensus among the fisheries agencies that there is larger and higher quality habitat for delta smelt and other species when X2 location is west of the confluence of the Sacramento and San Joaquin rivers.
- Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain mean daily water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run

Chinook salmon spawning in the lower Feather River. Stabilize flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.

- Stabilize flows in the Sacramento River between Keswick Dam and the RBDD to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation lifestage periods extending from October through March), particularly during fall months.
- Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at RBDD (into the T-C Canal) and at Hamilton City (into the GCID Canal), and by providing supplemental flows (at the proposed Delevan Pipeline). This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*) by reducing entrainment, providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.

Conceptually, the EESA would use Project assets, including storage and conveyance, to support modified operations that facilitate habitat enhancement actions. Use of these assets would be limited to supporting ecosystem enhancement actions and could not be used for other Project benefits or non-Project benefits. The EESA is conceptually intended to allow some ability to adaptively manage the list of operational actions supported by the proposed Project. The priority of actions included in the proposed Project action alternatives may change over time. New priorities may arise. Project planners recommend that any changes to the proposed EESA operational actions be subject to a relatively high degree of consensus of a governance board that would be formed to manage the ecosystem enhancement actions. Planning studies, including environmental documentation and permitting, may be required and could be funded by the Ecosystem Enhancement Fund (discussed below) if a modification is supported by the governance board.

3.1.2.2 Ecosystem Enhancement Fund—Nonoperational Actions

The proposed Ecosystem Enhancement Fund (EEF) would be established as an endowment to provide long-term funding for aquatic habitat restoration actions on the Sacramento River and its tributaries that do not necessarily require additional water. Projects funded through the EEF would be in addition to any proposed Project mitigation or CVPIA or OCAP requirements. Projects eligible for EEF funding would include those that would directly benefit anadromous fish, with an emphasis on actions in the Sacramento River (e.g., spawning gravel augmentation; side channel, riparian, or floodplain restoration; and instream aquatic habitat construction downstream from Keswick Dam). Similar to the proposed EESA, the EEF has been included in each proposed Project action alternative. The monetary size of the EEF would be the same in each alternative.

Seed money in the amount of $30 million would be invested into an interest bearing account. Each year, 90 percent of the accrued interest would be allocated by fund managers for fisheries habitat enhancement projects, with an emphasis on projects for the Sacramento River. The remaining 10 percent of the accrued interest would be rolled back into the account to ensure the long-term viability of the funding source. The growth of the fund is intended to allow fund managers to make ongoing contributions to facilitate non-operational actions, as the cost to implement those actions increases over time.

A governance board may be formed to manage the fund, prioritize potential projects, and collaboratively determine funded actions, based upon habitat needs. The fund would support planning and implementation of priority non-operational actions. Planning includes environmental documentation and permitting, as necessary. Projects funded by the EEF would be subject to environmental documentation and permitting separate from the proposed NODOS Project.

The EEF is currently in the conceptual stage, and is not an activity that may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, for which environmental review is yet required.

3.1.3 Reservoir Operations Common to all Action Alternatives

The operations evaluated in this environmental document represent an operational scenario designed to concurrently maximize achievement of the Project objectives of improving water supply reliability, increasing the survival of anadromous fish, improving Delta water quality, and providing flexible hydropower generation and minimize environmental impacts. One of the key components of the proposed operational scenario is the integration of new Project storage operations with operations of the existing CVP and SWP system and facilities. The integrated storage approach would facilitate a wider range of benefits. The foundational idea behind this approach is that operations of the existing system could be improved. Many of the needs associated with the existing operations strategy are directly related to storage. System storage is a primary driver for many operations decisions of the existing system, including delivery allocations, instream flows, and water quality requirements in the Delta. In addition, maintenance of the cold water pool in existing reservoirs is a storage target that has a certain reliability. The reliability of meeting these storage targets could be improved with new storage that is integrated; the reliability of existing reservoir storage targets could not be improved with new independent storage. Fundamentally, the system is more reliable when there is more water available in storage at any given time. More specifically, reliability could be improved for meeting ecosystem and water quality objectives, as well as for deliveries of agricultural, municipal and industrial, and environmental users. Through integrated operations of new Project storage, all three proposed Project action alternatives would be able to achieve the purpose of the Project and improve the ability to meet Project objectives.

The proposed operational scenario is reflected in the operations simulation modeling that is the primary planning tool to determine many of the proposed Project benefits and impacts. The ability of each proposed Project action alternative to implement the strategy effectively is subject to the proposed Project conveyance options included, the storage capacity of the proposed Sites Reservoir, and the coordinated operation of Sites Reservoir with other existing facilities.

The proposed operational scenario has three components: (1) operating criteria for diversion of flows from the Sacramento River to fill the proposed Sites Reservoir; (2) operating criteria to achieve benefits associated with the proposed Project primary objectives in specific year types (such as drought or driest periods) and other hydrologic conditions; and (3) integrating the operations[5] of Sites Reservoir with the SWP and CVP reservoirs, including Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Each proposed Project action alternative would be operated to divert Sacramento River flows to maximize the filling of the proposed Sites Reservoir as long as those flows were not needed to meet (1) existing CVP and SWP and other water rights diversions, (2) existing regulatory requirements including SWRCB D-1641 (SWRCB, 1999), CVPIA 3406(b)(2), the 2008 USFWS BO (USFWS, 2008), and the 2009 NMFS BO (NMFS, 2009) and other instream flow requirements, and (3) flow conditions to minimize the

[5] For purposes of this discussion, integrated operations means that water from Sites Reservoir can be used, in some cases, as a substitute for water from these other reservoirs. The needs and uses of the CVP and SWP systems could be met from an additional source, Sites Reservoir, by integrating Sites Reservoir operations with those of the other reservoirs.

impact of diversion operations on achieving the primary objectives for anadromous fish survival and Delta water quality. A schedule of flow criteria for Sacramento River flows at Red Bluff, Hamilton City, Wilkins Slough, and Freeport were used to limit the impact of proposed Project diversion operations. An additional set of criteria was used to identify and restrict diversions during potential pulse flow conditions to protect out-migrating anadromous fish.

Each proposed Project action alternative would be operated to achieve benefits associated with the Project's primary objectives in specific year types, including drought (i.e. driest periods) and other hydrologic conditions. For purposes of proposed Sites Reservoir operations, drought conditions are defined as the sequence of years in which the Sacramento Valley water year type[6] in two consecutive years is Critical following Critical, Dry, or Above Normal; Dry following Critical or Dry; or Above Normal following Critical year types. In drought conditions, the priority operations were: (1) cold water pool conservation in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake; (2) regulation of Sacramento River summer flows for best use of cold water for control of temperature conditions adverse to anadromous fish; and (3) increasing Delta export and SWP allocations to improve water supply reliability to South-of-the-Delta municipal and industrial water users. During these drought conditions, the proposed Sites Reservoir stored water would be released into the system as rapidly as possible to meet these needs and achieve these three objectives.

In other hydrologic conditions (non-drought), approximately one third of the proposed Sites Reservoir stored water would be used to (1) manage and improve Delta water quality in the summer and fall at municipal and industrial intakes, (2) improve flows for Delta fisheries habitat based on the X2 location, and (3) stabilize Sacramento River fall flows for improving spawning and rearing success of anadromous fish. Water quality for municipal and industrial users would be improved both by improving Delta water quality at municipal and industrial intakes in non-drought conditions, as well as increasing Delta exports in drought conditions (TDS levels in exports from the Delta are often lower than other supplies, such as from the Colorado River, so there is a blending improvement by increasing deliveries from the Delta).

Each proposed Project action alternative would be operated to integrate and coordinate the proposed releases from Sites Reservoir with releases from Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. Often, and especially in drought (driest periods) hydrologic conditions, proposed releases from Sites Reservoir would allow releases from other reservoirs to be reduced while still meeting requirements for minimum instream flow objectives and Delta salinity control objectives. Through this reduction in releases, storage could be conserved in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for other uses. This improvement in storage conditions throughout the system of reservoirs would add significantly to the operational flexibility and meet the Project's primary objectives of improving fish survival, Delta water quality, water supply reliability, and supporting renewable integration needs with hydropower in the most effective way possible.

With the increase in operational flexibility described above, recreation opportunities would also be increased. The secondary objectives would be met by accomplishing the Project's purpose and primary objectives.

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[6] Sacramento Valley Water Year Type Classification (40-30-30 Index), defined by the State Water Resources Control Board in Water Right Decision 1641 (SWRCB, 1999), classifies Sacramento Valley water year types in five categories: Wet, Above Normal, Below Normal, Dry, and Critical. The classification is determined based on the sum of the unimpaired runoff of four rivers: Sacramento River upstream of Bend Bridge, near Red Bluff; Feather River inflow to Oroville Reservoir; Yuba River at Smartville; and American River inflow to Folsom Reservoir.

For actions associated with hydropower generation, the performance of the proposed Project action alternative would depend on seasonal decisions and the type of hydropower operation. There are three types of hydropower operations that could be supported by proposed Project facilities:

- Seasonal hydropower is determined by the normal water operations of the proposed Project. As the Project pumps or releases water for its normal operation, power would be consumed or generated by the hydropower facilities.
- Daily pump-back hydropower operation is determined by the leftover capacity in the proposed Sites Pumping/Generating Plant and Holthouse Reservoir. When those facilities have extra capacity, the proposed Sites Reservoir would release water through the Sites Pumping/Generating Plant into Holthouse Reservoir during on-peak electrical times to generate high revenue power. During off-peak times, the water would be pumped back into Sites Reservoir.
- Renewable integration hydropower is determined by the need to firm up other renewable power sources, such as wind and solar. The proposed Project could release water through the Sites Pumping/Generating Plant to generate power to firm up those power sources when those types of power sources produce less power. Similarly, power could be consumed by pumping water into Sites Reservoir from Holthouse Reservoir when renewable sources peak and the grid has a surplus of power that can be "saved" for later generation when the renewable peak has diminished.

Offstream hydropower is well suited to provide flexible hydropower generation. Flexible hydropower generation, provided by the proposed Project's offstream reservoirs, could be ramped up or down quickly to complement wind or solar generation to meet electrical demands and support reliable operation of the power grid. Hydropower could also reduce greenhouse gas emissions when paired with solar and wind energy. To ensure that the greenhouse gas emissions from construction activities are mitigated within the first 15 years of operation, the proposed Project would: (1) obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and (2) use at least 20 percent of the project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation. The 20 percent integration with wind and/or solar energy goal will be achieved with variable speed pumping-generating units installed at the proposed Project's pumping/generating plants.

A schedule of proposed operations is provided in Table 3-7. Table 3-7 shows which type of beneficiary operation relates to the drought (driest periods) and other hydrologic conditions, and what priority is assumed for each operation within each class of hydrologic conditions. The season in which the operation would occur is also described.

3.1.4 Alternative A—Proposed Facilities Unique to Alternative A

Alternative A would focus on meeting the proposed Project's primary objectives by constructing a 1.27-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion), and the proposed Delevan Pipeline (2,000-cfs diversion/1,500-cfs release), to convey water to and from the reservoir. Alternative A would use the common features described in Section 3.1.1, in addition to the features described below.

3.1.4.1 1.27-MAF Sites Reservoir Inundation Area

The smallest reservoir configuration considered for the action alternatives is 1.27 MAF (Figure 3-1). The proposed 1.27-MAF Sites Reservoir would have a maximum water surface elevation of 480 feet above mean sea level (msl) (the minimum operating water surface would be at elevation 340 feet), and an inundation area of approximately 12,400 acres. The inundation area of the 1.27-MAF Sites Reservoir would be created by filling Antelope Valley after the construction of nine dams. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, one saddle dam near Golden Gate dam, one saddle dam north of Golden Gate Dam, and five saddle dams on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (all dams are discussed further in Section 3.1.4.2).

Many areas within the proposed Sites Reservoir Inundation Area would be used for staging of materials and equipment prior to and during construction of the Sites Reservoir dams.

Construction. The total construction disturbance area would be approximately 13,440 acres, consisting of the proposed inundation area footprint and temporary construction-related disturbance area. Anticipated ground-disturbing activities during construction include:

- **Clearing and Grubbing.** Approximately 94 percent of the reservoir inundation area footprint is composed of annual grasslands; as a result, clearing and grubbing would not be needed in this area. The remaining six percent consists of blue oak woodland, agricultural crops, and other vegetation, which would be cleared.
- **Demolition of Existing Structures.** Twenty-two houses and four detached garages, one mobile home, 26 barns, and 37 other structures (combination of sheds, silos, and a pump house) within the Sites Reservoir Inundation Area would be demolished. Existing septic tanks and other storage tanks would also be removed. In addition, many miles of fencing and asphalt would be removed, erosion protection may be needed for prehistoric midden locations, and elderberry shrubs may need to be removed from their existing location and relocated.
- **Cemetery Relocation**. There are two private cemeteries that will need to be relocated.

Operations. The proposed Sites Reservoir is considered an offstream storage facility because the reservoir would receive very little natural runoff from its own 83-square mile watershed. Average annual natural inflow into the reservoir would be 15,000 acre-feet, which is near one percent of the 1.27-MAF reservoir storage capacity. The reservoir would be filled predominantly by diversions directly or indirectly from the Sacramento River using existing or new conveyances. Specific reservoir operations are discussed in Section 3.1.3.

Maintenance. Maintenance activities for the proposed Sites Reservoir Inundation Area may include law enforcement, garbage removal, and maintenance of signs, culverts, and buoys.

Table 3-7
Description of Proposed Seasonal Schedule for Project Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General Operation															
Conveyance	Diversions at Red Bluff (T-C Canal), at Hamilton City (GCID Canal) and at the proposed Delevan Pipeline (if included) could occur in any month. Diversions of excess Delta flows would only be allowed once SWRCB D-1641, CVPIA 3406(b)(2), 2008 USFWS BO and 2009 NMFS BO requirements were met and SWP Article 21 demands were satisfied, and other excess Delta flow diversions (e.g., Freeport Regional Water Project, Los Vaqueros Reservoir, cities of Fairfield, Vacaville, and Benicia) were satisfied. Diversions would be restricted by Sacramento River bypass criteria at Red Bluff, Hamilton City, Wilkins Slough, and Freeport, and restrictions associated with protecting fish outmigration related pulse flows (7 to 10 days once a month when flow conditions provide). Shading highlights the period in which diversion operations would occur, with the November through March season shaded the heaviest.	n/a	n/a												
Seasonal Storage Operation	Fill Sites Reservoir during excess flow events throughout the winter and spring and drain during peak release periods throughout the summer and fall. The months in which the high and low storage points would occur in the typical seasonal cycle are indicated.	n/a	n/a		Fill Cycle High Point					Drain Cycle Low Point				Fill Cycle	
Water Supply Operations															
SWP Contractors	Increase water supply reliability up to Table A contract amount in years when SWP delivery allocation is below 85 percent. Shading highlights period in which Delta exports would be increased. Table A represents the maximum annual contract amount of water delivery that SWP contractors can receive.	DP-1	BN, D, C												
Level 4 Water Supply for Wildlife Refuges	Determine Level 4 wildlife refuge water supply by replacement of purchases of north-of-the-Delta (3.35 TAF per year maximum) and south-of-the-Delta (101.09 TAF per year maximum) water to supplement refuges supplies up to Level 4 criteria (CVPIA). Shading highlights period in which transfer operations would occur.	AVG-3	AN,BN,D												
CVP Contractors	Determine CVP water supply reliability by reliability increase in any year when water supply availability limits allocations. There would be little effect if Delta export capacity is limiting allocations. Reliability increase would mostly affect agricultural service contractors. Shading highlights the typical agricultural diversion pattern.	AVG-4	AN,BN,D												
Water Quality Operation															
Delta Water Quality	Determine ability to improve water quality conditions at urban/municipal and industrial intakes by ability to augment Delta outflow. Operations would include Delta outflow augmented above base D1641 operations for up to six months with monthly rate varying within 750-cfs, 1,000-cfs and 1,500-cfs tiers; maximum of 450 TAF per period. Shading highlights period in which Delta outflow would be augmented.	AVG-1	AN,BN,D												
Hydropower Operation															
Flexible Hydropower Generation	Include dedicated pump/generation facilities with a dedicated afterbay/forebay of 6,500 acre-feet allowing more than 30 hours per week of uninterrupted operation and generation potential increases with increased head conditions and revenue increases with increased difference in prices between diurnal pumping and generation cycles.	n/a	ALL												
Ecosystem Enhancement Storage Account (EESA) Actions/Operation															
EESA-1: Shasta Coldwater Pool	Improve the reliability of coldwater pool storage in Shasta Lake to increase Reclamation's operational flexibility to provide suitable water temperatures in the Sacramento River. This action would operationally translate into the increase of Shasta Lake May storage levels, and increased coldwater pool in storage, with particular emphasis on Below Normal, Dry, and Critical water year types.	DP-1	BN, D, C												
EESA-2: Sacramento River Flows for Temperature Control	Provide releases from Shasta Dam of appropriate water temperatures, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and lifestages of anadromous salmonids in the Sacramento River between Keswick Dam and Red Bluff Diversion Dam, with particular emphasis on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types.	DP-2	BN, D, C												
EESA-3: Folsom Lake Cold Water Pool	Increase the availability of coldwater pool storage in Folsom Lake, by increasing May storage and coldwater pool storage, to allow Reclamation additional operational flexibility to provide suitable water temperatures in the lower American River. This action would use additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to maintain mean daily water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during all water year types.	DP-2	D, C												

Table 3-7
Description of Proposed Seasonal Schedule for Project Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]
EESA-4: Stabilize American River Flows	Stabilize flows in the lower American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce juvenile anadromous salmonids isolation events (specifically, flow increases to 4,000 cfs with subsequent reduction to < 4,000 cfs), particularly from October through June. Reduce the reliance upon Folsom Lake as a "real-time first response facility" to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the lower American River.	DP-2	ALL	
EESA-5: Delta Outflow for Delta Smelt Habitat Improvement (Summer/Fall)	Provide supplemental Delta outflow during summer and fall months (i.e., May through December) to improve X2 (if possible, west of Collinsville 81 km) and increase estuarine habitat, reduce entrainment, and improve food availability for anadromous fishes and other estuarine-dependent species (e.g., delta smelt, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*). Shading highlights period in which Delta outflow would be augmented (operation coordinated with Delta Water Quality action).	AVG-2	ALL	
EESA-6: Lake Oroville Coldwater Pool	Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain mean daily water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River. Stabilize flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.	DP-2	BN, D, C	
EESA-7: Stabilize Sacramento River Fall Flows	Stabilize flows in the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation lifestage periods extending from October through March), particularly during fall months. Avoid abrupt changes. Operations would be limited to not adversely impact coldwater pool operations in dry and critical years. Shading highlights period of greatest effect on stabilization or flows on a daily basis.	AVG-1	AN,BN,D	
EESA-8: Sacramento River Diversion Reduction at Red Bluff and Hamilton City	Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at Red Bluff Diversion Dam (into the T-C Canal) and at Hamilton City (into the GCID Canal), and by providing supplemental flows at the proposed Delevan Pipeline Intake/Discharge Facilities. This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*) by reducing entrainment, providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.	n/a	ALL	

[a]Priority of operation "DP" indicates that the operational priority has a driest period's emphasis and "AVG" indicates an average-to-wet hydrologic emphasis. The number 1-4 indicates priority within the associated hydrologic emphasis. "n/a" indicates that operations are not or cannot be easily defined within the priority structure of the scenario.

[b]Year type most suitable for operation is the D1641 40-30-30 year types that are reflected in operations studies; operations in these year types occur when supplies would be available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

[c]The heavier shaded parts of each bar highlight the months in which conditions would be most suitable to the operations; the lighter shaded parts of each bar highlight the months that would be less suitable to the operations; operations in these months would occur when supplies are available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

Notes:

AN = Above Normal
AVG = Average
BN = Below Normal
C = Critical
D = Dry
DP = Driest periods
GCID = Glenn-Colusa Irrigation District
NMFS = National Marine Fisheries Service
TAF = thousand acre-feet
T-C Canal = Tehama-Colusa Canal
USFWS = U.S. Fish and Wildlife Service

3.1.4.2 Dams for the 1.27-MAF Sites Reservoir

Nine dams would be needed to create the proposed 1.27-MAF Sites Reservoir (Figure 3-1): Golden Gate Dam, Sites Dam, one saddle dam near Golden Gate dam, one saddle dam north of Golden Gate Dam, and five saddle dams along the northern perimeter of the reservoir between the Funks Creek and Hunters Creek watersheds, near the Glenn-Colusa County line. The proposed Golden Gate Dam would be constructed on Funks Creek, approximately one mile west of the existing Funks Reservoir. The proposed Sites Dam would be constructed on Stone Corral Creek, approximately 0.25 mile east of the town of Sites and ten miles west of the town of Maxwell.

The Golden Gate Dam location was selected to optimize material quantities and construction costs with respect to the site topography. For the 1.27-MAF Sites Reservoir, the Golden Gate Dam would be located on the western edge of the ridges that form the east reservoir rim. This damsite is only suitable for reservoir elevations less than approximately 480 feet due to steep and narrow abutment ridges. Construction of an additional small Golden Gate saddle dam would be required. Due to the small size of this proposed saddle dam relative to the main Golden Gate Dam, the saddle dam materials and cost estimates have been included in the estimates for the main Golden Gate Dam.

The seven proposed saddle dams would be constructed as earthfill embankment dams, and are designed to be constructed primarily of on-site materials. Site topography, geology, seismicity, and foundation features were considered when selecting the dam alignments, design, and sections. The dam designs would conform to modern economic construction practices and incorporate conservative design measures. Table 3-8 lists the proposed height and length of the main and saddle dams, as well as the total volume of materials needed to construct the dam embankments.

Table 3-8
Characteristics of Proposed 1.27-MAF Sites Reservoir Dams for Alternative A

Dam	Maximum Height Above Base* (feet)	Crest Length (feet)	Total Embankment Volume (cubic yards)
Golden Gate Dam	270	2,250	5,987,000
Sites Dam	250	850	2,853,000
Saddle Dam No. 1	10	490	1,400
Saddle Dam No. 3	90	3,810	1,365,000
Saddle Dam No. 5	60	2,290	398,000
Saddle Dam No. 6	10	530	9,000
Saddle Dam No. 8a	65	2,990	390,000
Saddle Dam No. 8b	5	340	15,000
Golden Gate Saddle Dam	Included within Golden Gate Dam	Included within Golden Gate Dam	Included within Golden Gate Dam
Total			**11,018,400 cubic yards**

*Base is defined as ground surface elevation.

The crest elevation of all nine dams would be 500 feet, providing 20 feet of freeboard. Sites and Golden Gate dams would have crest widths of 30 feet and embankment slopes of 2.25:1 upstream and 2:1 downstream. The saddle dams would have crest widths of 20 feet and embankment slopes of 3:1 upstream and 2.5:1 downstream.

The nine dams would be constructed of compacted excavated materials (soil and rock). The four zones of the embankment dams are:

- **Zone 1:** Impervious core material comprised of low to medium plasticity clays, with lesser amounts of high plasticity clays and clayey sands.
- **Zone 2:** Filter, drain, and transition materials consisting of fresh rock processed to various sizes to meet filter compatibility and hydraulic conductivity requirements.
- **Zone 3:** Shell material consisting of processed clean rockfill up to 30-inch maximum particle size.
- **Zone 4:** Random material comprised of materials unsuitable for use as clean rockfill.

Material requirements for the Sites Reservoir dams constitute a major component of the overall proposed Project. A preliminary construction materials investigation identified and evaluated material sources for construction of the proposed dams. The construction materials investigation program examined materials available in or near the proposed Sites Reservoir, including alluvial deposits (recent and older alluvium), Venado sandstone of the Cortina Formation (fresh and weathered), and mudstone of the Boxer Formation. These material sources were investigated, tested, and evaluated to examine their suitability for use as the following types of construction materials:

- **Impervious core (Zone 1) –** A large amount of potential impervious material exists within or near the proposed Sites Reservoir area. Previous studies by Reclamation identified four main areas of alluvial deposits in the reservoir area encompassing roughly 36 million cubic yards of material. Additional impervious materials are located within required excavation areas for the appurtenant structures and the proposed Holthouse Reservoir Complex. These required excavation areas would be used to the maximum extent practicable. Additional quantities of impervious materials are located within the reservoir inundation area. The locations of these potential borrow areas are illustrated in Figure 3-7. The impervious materials are suitable for use in the proposed embankment dams, and are generally classified as low to medium plasticity clays, with lesser amounts of high plasticity clays, and clayey sand. If borrow areas inside the reservoir footprint prove inadequate, commercial sources would be used.
- **Filter, drain, and transition materials (Zone 2) –** Filter, drain, and transition materials for the proposed embankment dams would be imported from the closest off-site sand and gravel deposit, identified as an old channel on Stony Creek (between Orland and Willows), if additional testing of the Venado sandstone deposit (located within one mile of Golden Gate and Sites dam sites) indicates that it is not suitable. The Stony Creek deposit is approximately 30 to 35 miles from the Project area, and has an estimated material availability of 160 million cubic yards, which would exceed the Project construction requirement.
- **Rockfill and riprap (Zone 3) –** The best available source of clean rockfill material within the Project area is fresh Venado sandstone. Sandstone quarry areas have been identified within the reservoir inundation area and are presented in Figure 3-7. Sufficient quantities of fresh sandstone for rockfill material could be obtained from these quarries to construct the proposed embankment dams. It is possible that one centrally located quarry would be developed for Golden Gate and Sites dams instead of developing a quarry for each dam.

  Figure 3-7 also shows a proposed sandstone quarry location for construction of the saddle dams. The haul distance from this proposed quarry is approximately three to four miles from the saddle damsites. A potential alternate source of rockfill and riprap material for construction of the saddle dams is a ridge of conglomerate located within the reservoir area near Saddle Dam 3 (Figure 3-7). This potential rockfill source offers a shorter haul distance to the saddle dams (one to two miles). Development of the Venado sandstone quarry would be required for construction of the saddle dams, unless further testing of the conglomerate determines that it is a suitable material.

- **Random fill (Zone 4) –** It is anticipated that two general types of random materials would be generated during construction, depending upon the source of the material. One type of random material would be comprised of predominately weathered sandstone from the Cortina Formation, and the other type would be predominately mudstone from the Boxer Formation. Mudstone from the Boxer Formation would tend to be “soil like” after excavation and compaction operations because it is a low strength rock and tends to break down when exposed to air and water. The weathered Cortina Formation tends to have more fine materials and have less well-graded rockfill.

  At the Sites and Golden Gate damsites, random embankment material would be comprised of materials unsuitable for use as clean[7] rockfill. It would consist of weathered sandstone, mudstone, and slopewash from excavations for the dam foundations, appurtenant structures, and rockfill quarries. Material from clearing and grubbing operations would not be used in any embankment structure. Random material generated during construction of these dams would have haul distances of less than one mile.

  Random material would be generated from the Boxer Formation during construction of the saddle dams and designated borrow areas. Random material borrow areas for construction of the saddle dams have not been identified, but would be located within the reservoir area with haul distances of less than one mile. Sufficient quantities are available for construction of the saddle dams. Although the Boxer Formation material would function more as an upstream and downstream shell zone in the saddle dams, the term *random* is used for this material zone to be consistent with the terminology used for the design of Sites and Golden Gate dams.

- **Concrete aggregate –** Crushed Venado sandstone and off-site sand and gravel deposits were examined as potential sources of concrete aggregate. Preliminary testing performed on crushed samples of Venado sandstone indicates that it marginally meets concrete aggregate suitability criteria. Verification of the suitability of the Venado sandstone for use as concrete aggregate would be the focus of future investigations. Potential commercial sources of concrete aggregate borrow areas located north of the Primary Study Area, between Willows and Orland, are identified on Figure 3-8. These borrow areas would be used unless the additional testing mentioned above indicates that the Venado sandstone is suitable for concrete aggregate.

For the 1.27-MAF Sites Reservoir, there would be a minimal dam at the Saddle Dam No. 6 site because the ground level of the saddle is approximately at elevation 500 feet, 20 feet above the reservoir maximum operating level. However, it is anticipated that a core trench backfilled with clay would be required across the saddle to control seepage when the water is at or above the maximum operating level. A proposed emergency spillway at the 1.27-MAF Sites Reservoir would be located at Saddle Dam No. 6. The purpose of the spillway would be to release excess water as the result of overpumping after a probable maximum flood[8] (PMF), and to prevent overtopping the dams. If the PMF were to occur when the reservoir was at the normal maximum pool elevation (elevation 480 feet), the water surface elevation

[7] Clean rockfill refers to rockfill that is free from foreign matter.

[8] The probable maximum flood is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that is reasonably possible in the drainage basin being studied.

would rise to 486.25 feet. The dam crest elevation is 500 feet. Therefore; the spillway would be required only in the event that water was still being pumped into the reservoir after the PMF had been stored (an unlikely occurrence). The spillway at this location would include an excavated entry channel, a pipe through the saddle (and core trench), and an energy dissipating structure at the downstream end of the pipeline. The spillway would consist of one seven-foot-diameter concrete pipe sized primarily to accommodate inspection and maintenance activities. The invert of the spillway inlet would be at elevation 486.25 feet, 6.25 feet above the normal maximum pool.

Construction. The total construction disturbance area for the nine proposed dams would be approximately 90 acres. The total construction disturbance area would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, borrow areas, and access roads. The construction disturbance area for the dams would be within the construction disturbance area for the proposed Sites Reservoir Inundation Area.

Anticipated ground-disturbing activities during construction include:

- Surveying
- Setting up staging areas within the Sites Reservoir footprint
- Constructing access roads
- Transporting equipment to the Project site and setting up offices and batch plants
- Clearing and grubbing
- Diverting streams
- Excavation and stockpiling activities
- Grouting of foundations
- Construction of dam embankments
- Installation of monitoring equipment
- Constructing roads and buildings for facility operation and maintenance
- Project area cleanup, removal of equipment, and area restoration

Some of these activities are discussed in greater detail below:

- **Funks Creek and Stone Corral Creek Diversion Construction.** Diversion of Funks and Stone Corral creeks during construction of the proposed Golden Gate and Sites dams, and for the proposed facilities downstream, is anticipated to be accomplished by passing storm flows through a buried corrugated metal pipe or concrete pipe around the two construction areas. A low coffer dam would provide a dead pool large enough to protect the damsites from seasonal stream flows. During construction of Golden Gate and Sites dams, small coffer dams upstream of each damsite would provide protection for an approximately 50-year probability storm. Diversion at the entrance to the inlet/outlet works tunnel would require a coffer dam to approximately elevation 310 feet. Coffer dam installation would involve driving interlocking corrugated sheet piles into the ground. Diversion pipe installation would involve excavation, if necessary, laying of the two pipelines, and backfilling and grading around the pipe, as necessary.

  The upstream random zone of Golden Gate and Sites dams functions as an upstream toe berm, provides a convenient place to put waste materials from foundation excavation work during the initial stages of construction, and would also be used to divert Funks and Stone Corral creeks from the dam footprint.

  Sites Dam and Golden Gate Dam would have low-level outlet works capable of releasing stream maintenance flows of up to 10 cfs from October through May into Stone Corral Creek and Funks Creek after construction is completed to mimic the ephemeral nature of these streams. These low level outlet works would be incorporated as permanent facilities in the creek diversion systems installed at both damsites to pass winter storm runoff through the construction sites.

- **Obtaining and Stockpiling Borrow Materials.** To expedite dam construction, rockfill, drain, filter materials, and concrete aggregate would be excavated, processed, and stockpiled one year prior to the start of construction. Materials would be stockpiled near rock-processing plants that would be constructed for the proposed Project. It is anticipated that at least one rock-processing plant would be located within the reservoir footprint to service the impervious material borrow areas and the sandstone quarries.

  The rock-processing operation would consist of rock crushers to produce required sizes, shakers and screens to sort material sizes, and conveyor belts to transport sorted material to stockpiles.

  Stockpiled materials would be loaded by bulldozers, loaders, and possibly conveyors into large dump trucks and transported to the dam construction sites.

  Material excavation, processing, and stockpiling are anticipated to occur throughout the dam construction period.

- **Foundation Excavation.** Recent and older alluvium and decomposed and intensely weathered bedrock would be excavated from the entire footprint of the damsites to obtain a moderately weathered bedrock surface. In addition, moderately weathered bedrock would be excavated from the impervious core footprint down to the top of slightly weathered and/or fresh bedrock surface. Additional shaping of the foundations would be done to meet requirements that: (1) no excavation slopes should be steeper than 1:1 and (2) the core foundation should be approximately level in sections transverse to the dam alignment. To meet the second shaping requirement, a maximum transverse slope of 6:1 was adopted for the core foundation. Excavation depths would average approximately 20 feet. Excavation would be performed by the use of heavy equipment, but may require some blasting in the harder sandstone.

- **Foundation Treatment Grouting.** The foundation grouting for the proposed Golden Gate and Sites dams would consist of a two-row grout curtain, with one row of consolidation holes upstream and one row downstream of the curtain holes. The rows would parallel the dam centerline and would be spaced 10 feet apart. In addition, a 40-foot-wide by three-foot-thick grout cap was included in the design to prevent grout surface leakage during grouting of the upper stage. Foundation grouting for the proposed saddle dams would consist of a two-row vertical grout curtain spaced 10 feet apart parallel to the dam centerline. The saddle dam foundation grouting would also include a 20-foot-wide by three-foot-thick grout cap to prevent surface leakage of grout during grouting of the upper stage. Each row of consolidation and curtain grout holes for all dams would consist of mandatory primary and secondary holes spaced at 10 foot centers. Figures 3-9, 3-10, 3-11, and 3-12 show typical grouting at the proposed Golden Gate Dam, Sites Dam, and the saddle dams.

  The grout curtains would be constructed by drilling vertical holes into the bedrock and filling the holes with grout pumped in under pressure.

- **Dam Embankment Construction.** All proposed dams comprising the proposed Sites Reservoir would be constructed as zoned earth rockfill embankment dams, and would be constructed of four types of fill materials. The impervious core materials (finer material known as Zone 1), Zone 3 materials (rockfill and riprap), and Zone 4 materials (random materials) would be hauled in large dump trucks from the borrow sites that would be located within the reservoir footprint, spread by graders or bulldozers, moisture-conditioned with water trucks, and compacted with sheepsfoot rollers or compactors. Zone 2 materials (filter, drain, and transition materials) would be hauled in large dump trucks from commercial sources along the Stony Creek fan.

- **Monitoring Equipment Installation.** Monitoring equipment would be permanently installed at each proposed damsite including strong motion detectors and water pressure monitors.

Operations. Once the proposed dams are constructed and Sites Reservoir is filled, there would be few dam operations required other than release of water from the reservoir during normal or emergency operations.

Maintenance. Typical ongoing dam maintenance would consist of equipment, foundation, and embankment inspections and repairs. Debris and vegetation removal from the embankments and along the roads would be required. In addition, ongoing movement and seepage monitoring would be necessary. Dam security and/or law enforcement staff would patrol the proposed dams and other proposed Project features. Additional security measures may include fences to prevent automobiles and pedestrians from accessing the dams and other Project features, booms to prevent boats from approaching the dams, security gates, 24-hour security patrols, and security cameras.

3.1.4.3 Delevan Pipeline Intake Facilities

The proposed Delevan Pipeline Intake Facilities are a system of structures designed to divert water from the Sacramento River to the proposed Holthouse Reservoir for storage in the proposed Sites Reservoir. The facilities would also minimize harm to fish, safely release water from Sites Reservoir to the Sacramento River, and generate electricity when water is released from Holthouse Reservoir through the proposed Delevan Pipeline to the Sacramento River.

The proposed Delevan Pipeline Intake Facilities would be located on the Sacramento River at River Mile 158.5 in Colusa County (Figure 3-13A). The river intake/outlet would be located immediately downstream of the existing Maxwell Irrigation District intake and across the river from Moulton Weir, approximately 10 miles northeast of the town of Maxwell (Figure 3-13B). The total footprint of the site would be approximately 19 acres including the pumping plant buildings, fish screen, forebay, and afterbay.

Water that passes through the fish screen would be pumped up approximately 150 feet vertically through two 12-foot-diameter concrete pipes to Holthouse Reservoir. Water would also be able to flow back from Holthouse Reservoir, by gravity, to the Sacramento River. Reverse flow water would flow through the turbines to generate electricity. The water would then flow through the forebay and fish screen at a velocity of one foot per second into the Sacramento River. The one fps exit velocity is based on NMFS criteria for adult salmon diffusers to allow the water to exit the screen without extending a false attraction flow to the salmon.

The proposed pumping capacity of the Delevan Pipeline Intake Facilities would be 2,000 cfs when diverting water from the Sacramento River, and 1,500 cfs when releasing water to the Sacramento River (and generating electricity). Total lift capacity of the facility would be approximately 150 feet.

The proposed facilities at this site would include:

- **Flat plate fish screen structure –** The purpose of the fish screen structure would be to exclude fish that are present in the Sacramento River from the water that is being diverted into the pump station. The fish screen would also function as an outlet structure, dissipating the energy of the water being released to the river.

  The fish screen structure would consist of 32 13-feet-tall by 15-feet-wide flat plate screens. The structure would be approximately 560 feet long (the distance created by the 32 screens bays, the additional two blowout bays, and room for the screen cleaning equipment). Panels would be positioned with minimum protrusion into the river channel parallel to river flow. This facility has been designed in compliance with NOAA Fisheries and CDFW fish screen criteria.

- **Forebay, levee tubes, and afterbay –** After water passes through the fish screen it would flow into a 1.3-acre forebay. The forebay would allow fine sediment that is carried in the water to settle out. Water then travels through the levee tubes to pass under the existing Sacramento River levee and into the afterbay. The afterbay is a 2.3-acre concrete lined bay that would store water before it is pumped out by the pumping/generating plant.

  The levee tubes are a means to transfer water from the river through the levee to the pumping/generating plant afterbay. As the water enters the tubes, it would pass through a trash rack and sluice gate. It then would travel through 10 nine-foot-diameter pipes and exit through a trash rack into the afterbay. The tubes would handle a maximum flow of 2,000 cfs and maintain a velocity no greater than three fps during operation. The velocity through the pipes would allow for sediment to pass through without settling, and it would also minimize turbulence. The levee tubes' design would maintain a maximum velocity of three fps at 2,000 cfs during pumping intake and 2.3 fps at 1,500 cfs during discharge.

  A Sediment Spoil Area would be provided on the northeastern end of the afterbay for sediment removal. To remove sediment, a long arm excavator would be required in combination with a suction dredge or a clamshell. The suction dredge or clamshell would be used to remove the additional sediment in the area where the excavator could not reach. The sediment would ultimately be placed on the adjacent levee.

- **Pumping/generating plant –** The Delevan Pipeline Intake Facilities would pump water from the afterbay to Holthouse Reservoir and would also function to release water from Holthouse Reservoir. The Delevan Pipeline Intake Facilities building would be approximately 250 feet long by 80 feet wide and would have multiple stories to accommodate mechanical and electrical equipment. The pumping/generating plant would consist of four 600-cfs pumping/generating units (plus one standby unit) to provide a total pumping capacity of 2,000 cfs. Water would be pumped by the pumping/generating plant 150 feet up over 13.5 miles through the Delevan Pipeline. When water is released from Sites Reservoir and through Holthouse Reservoir, the intake facilities would function in reverse, capturing the energy and generating electricity. Release flows of up to 1,500 cfs could be passed through the pumping/generating plant.

- **Switchyard –** An electrical switchyard would be required adjacent to the pumping/generating plant that would step down the electrical voltage from high voltage lines to a lower voltage that can be used by the pumps and other machinery in the plant. A four breaker ring bus would be required at the switchyard. The ring bus would have multiple metallic poles with heights varying between 15 feet tall and 60 feet tall. The switchyard would be surrounded by a six to eight-foot-high chain link fence with barb or serpentine wire along the top.

- **Maintenance and electrical buildings –** Mechanical control and electrical buildings would also be constructed on the site to house mechanical and electrical equipment needed for the operation of the pumping/generating plant. The mechanical and electrical buildings would be approximately 5,000 square feet each. Facilities would be sited and designed such that electrical equipment would be sealed or placed at an elevation above the 100-year flood stage plus two feet of freeboard (elevation 82 feet).
- **Access Road –** A new on/off ramp from/to State Route 45 (SR 45) would be constructed to provide access to the pumping/generating plant. The width of the access road would be approximately 40 feet. The road would lead to both the pumping/generating plant building and flood gates.
- **Other Mechanical & Electrical Features –** Other miscellaneous features that may be included:
  - Spherical Valves
  - Air Chambers and Butterfly Valves
  - Compressors, Generators, Cranes
  - Service Air and Water Systems
  - Acoustical Flowmeters
  - Governors
  - Transformers
  - Switchgears
  - Grounding Grids
  - Controls Cabinets

The proposed Delevan Pipeline Intake Facilities site would be protected from flood conditions by constructing all of the mechanical and electrical equipment above the 100-year flood elevation (82 feet above msl). Although the forebay and afterbay would be submerged during extreme flood events, they would be designed to withstand these conditions. The site naturally slopes upward away from the river, and a flood protection levee with a height of 90 feet msl exists along the river approximately 275 feet west of the river. A wide berm or ring levee would be constructed behind the flood protection levee to provide additional protection for the equipment and facilities. The berm would encircle the afterbay, and the Delevan Pipeline Intake Facilities would be constructed on top of the berm, as would the mechanical and electrical buildings.

Construction. The total construction disturbance area would be approximately 19 acres. An additional disturbance area around the construction site would be required for staging of materials, equipment, and construction offices. This area is within the construction disturbance area for the proposed Delevan Pipeline. The staging area is estimated to be 1,700 feet by 1,000 feet (a total of 40 acres) located to the north of and adjacent to the facility site.

To isolate the proposed construction area from the Sacramento River, a cellular sheet pile coffer dam would be installed in the river near the location of the fish screen. Approximately 1,200 feet of sheet piles would be required to build the cofferdam. From the river bank at the upstream and downstream ends of the fish screen structure, the cofferdam would extend approximately 40 feet into the water from the river bank. Installation of the coffer dam would involve driving interlocking metal sheet piles into the ground one section after another until the entire length of the intake structure is isolated from the river. The height of the coffer dam would match the height of the surrounding levees. The coffer dam is likely to remain in place throughout the duration of facility construction. The area behind the coffer dam would be dewatered prior to construction by pumping water out from behind the coffer dam. After construction of the pump station is complete, the coffer dam would be removed by pulling the sheet piles out of the river.

Anticipated major construction activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing necessary construction materials at staging areas
- Construction of a coffer dam within the Sacramento River
- De-watering the work area within the river
- Excavation of the forebay and pumping plant site
- Construction of electrical switchyard
- Construction of the berm/ring levee
- Construction of the pump house and pump bays
- Construction of the forebay structure
- Construction of the fish screens
- Removal of the coffer dam
- Fill and re-grading where needed at site
- Restoration of disturbed areas following the completion of construction

Construction of the proposed Delevan Pipeline Intake Facilities would require relocation of sections of the Maxwell Irrigation District and Tuttle Ranch pipelines that are located within the construction disturbance area. To minimize impacts to the operations of the Maxwell Irrigation District facilities during construction, either a temporary bypass pipeline would be constructed to provide water to Maxwell Irrigation District users, or arrangements will be made for supplemental water to be conveyed into the Colusa Basin Drain (CBD) for the Maxwell Irrigation District to pick up for delivery to its users. A temporary bypass pipeline would be constructed to provide water to Tuttle Ranch to irrigate its orchards.

Operations. Proposed diversion operations would be such that a minimum of 4,000 cfs would remain in the river channel immediately downstream of the diversion point. The assumed associated minimum water surface elevation at this design condition is 51 feet. The invert of the screen structure is set at 38 feet, four feet above the invert of the river, to reduce sediment deposition in front of the screen panels.

- **Intake Mode**: The Intake Mode is when water would be pumped from the Sacramento River to the proposed Sites Reservoir when the largest flows and velocities occur. Flow of water would move through the fish screen into the forebay, through the levee tubes, into the afterbay, through the proposed Delevan Pipeline to the proposed Holthouse Reservoir, and then to Sites Reservoir. During this operation, the screen cleaning mechanism would be working continuously to prevent buildup on the screen panels, the sediment removal system would be operating, the pumps would be operating, and the SCADA system would be monitoring water levels and pressures across the screen.

- **Discharge Mode:** The Discharge Mode is when water from Sites Reservoir would flow back through the pumping plant and into Holthouse Reservoir to generate electricity, is released into Delevan Pipeline and discharged into the afterbay, through the levee tubes, and into the forebay, and then released through the fish screen into the Sacramento River. During this operation, the fish screen cleaning mechanism would not need to operate because it would be located on the river side of the fish screen, the sediment removal system would remain in operation, and the SCADA system would be monitoring water levels and pressures across the screen.

- **Emergency Mode:** When the diversion would operate in intake or discharge mode and a pressure differential greater than 1.5 feet across the fish screen occurs, Emergency Mode would be activated. The pumps would stop operating, and the sluice gates would close to allow the forebay to fill up to match the water surface of the Sacramento River. If the pressure differential grows to above three feet, then the two blowout panels would trigger and release to allow an inflow of river water to allow the water levels to equalize. Additionally, if the river is at a very high water level and the pumps need to turn off, the sluice gates should close at the same rate that the pumps power down to prevent flooding of the afterbay.

A SCADA system would control all of the different operational modes. The system would be located on-site, and would broadcast status information to a manned remote location. The SCADA system provides a means to control the diversion without staffing the on-site facility.

A sediment removal system would be installed within the fish screen bays, moving sediment back into the river channel or into the forebay. Sediment that has settled out into the forebay would be removed mechanically to maintain optimal operational hydraulics. This would likely be an annual operation.

Maintenance. The proposed Delevan Pipeline Intake Facilities would likely be staffed daily to maintain, operate, and monitor the facility. It is anticipated that employees would be on-site during diversion (predominantly in winter) and release (predominantly in summer) activities.

3.1.4.4 Delevan Pipeline – 2,000-cfs Diversion/1,500-cfs Release

The approximately 13.5-mile-long proposed Delevan Pipeline would convey water from the Sacramento River to the proposed Holthouse Reservoir to fill the proposed Sites Reservoir, and would also convey water from Holthouse Reservoir to the Sacramento River for releases (Figure 3-1). The portion of the Delevan Pipeline that would be located to the west of the proposed TRR would parallel the proposed TRR Pipeline from the TRR to Holthouse Reservoir, and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-6).

The Delevan Pipeline would be bi-directional, allowing water to be pumped from the Sacramento River to Holthouse Reservoir for storage, and allowing water to flow by gravity from Holthouse Reservoir for release to the Sacramento River. As water released from Holthouse Reservoir flows through the pump station at the eastern end of the pipeline, it would pass through turbines to generate electricity.

The Delevan Pipeline would have a 2,000 cfs capacity to convey water from the proposed Delevan Pipeline Intake Facilities to Holthouse Reservoir. The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. The Delevan Pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

The Delevan Pipeline would begin at the Delevan Pipeline Intake Facilities near the Sacramento River. The Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would be aligned southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

Proposed facilities associated with the Delevan Pipeline include blow-off structures, air valve structures, and an outlet and energy dissipater structure. Blowoff structures would be provided to clean low points in the pipeline and allow dewatering. Blowoff valves would release water from the pipeline. These valves are located at major water conveyances so that water can be drained directly into the river or canal and carried downstream. Air and vacuum valves would be required to evacuate air within the pipeline during filling, and supply air during normal dewatering, as well as to release accumulated air. Manholes would be used to access the pipeline for future maintenance or inspections. Aboveground features associated with the Delevan Pipeline are listed in Table 3-9.

Table 3-9
Aboveground Features Associated with the Proposed Delevan Pipeline

Aboveground Feature	Height Above Ground	Color	Appearance	Feature Locations
Manhole and Air Valve	4 feet Maximum, 108 inches Diameter	Gray	Concrete Box	At high points and at a minimum of every 2,500 feet along the pipeline
Manhole and Blowoff Valve	1 foot Maximum, 108 inches Diameter	Gray	Concrete Box	At low points and at the Sacramento River and the GCID Canal Crossing

The proposed alignment of the Delevan Pipeline would require five major crossings (SR 45, SR 99, Interstate-5 (I-5), Union Pacific Railroad, and the GCID Canal). The proposed pipeline route would also cross the easements of the existing PG&E 230-kV electrical transmission line and a major PG&E natural gas pipeline. No permanent aboveground structures, other than a gravel maintenance road (TRR Pipeline Road), would be constructed where the electric utility easements and the pipeline easements would intersect. Other existing infrastructure that the pipeline could potentially cross include: gas lines, water lines, sewer lines, communications lines, and other infrastructure. These major crossings would be accomplished with jack and bore construction.

In addition, the Delevan Pipeline would cross the CBD. The crossing location would be at the northern end of the drain. Construction of this crossing would likely occur during late fall, after the irrigation season ends and before winter rains begin. Portions of the CBD would likely be dewatered so that the pipeline trench could be excavated and the pipeline could be installed. Construction would be staged at this crossing and would occur within one half of the channel while an installed coffer dam bypasses flows on the other half of the channel. After installation, the CBD would be returned to service and would be reconstructed to pre-Project conditions.

Construction. The construction disturbance area of the proposed Delevan Pipeline would be approximately 2,500 acres. The construction disturbance area would include a temporary concrete batch plant (the same plant as used for the proposed TRR Pipeline).

Construction of the Delevan Pipeline would likely be done in three independent and concurrent sections. Two of the sections would likely begin from the same point and move in opposite directions. As pipelines are installed and tested, the trench would be backfilled to minimize the amount of open trenching.

The construction disturbance area for the Delevan Pipeline would be a linear area 13.5 miles long and approximately 300 feet wide from the Sacramento River to the proposed TRR (10 miles) and approximately 335 feet wide from the TRR to the proposed Holthouse Reservoir (3.5 miles). The additional width of the construction disturbance area would be needed to accommodate the additional TRR Pipeline from the TRR to Holthouse Reservoir. An additional construction disturbance area of 20 acres would be required for a concrete batch plant. Construction disturbance area boundaries would be marked with tape, flagging, or fencing. The construction disturbance area would pass through multiple areas close to residences, and would intersect with several roads. The entire Delevan Pipeline construction disturbance area would not be fenced. In high visibility areas or where the construction site requires a higher degree of protection for security or safety, a six-foot-high chain link fence would be installed around the work site.

- **Trenching/Excavation of Pipeline Route –** Approximately 6.3 million cubic yards of material would be excavated for the Delevan Pipeline trench. Topsoil would be stockpiled separately from other excavated materials. Trench excavation would be approximately 23 feet deep. For the portion of the Delevan Pipeline that would be installed between the Sacramento River and the TRR, the trench would be approximately 120 feet wide. A total of two 12-foot-diameter pipelines would be installed from the Sacramento River to the TRR. Trench excavation for the 3.5 miles from the TRR to Holthouse Reservoir would be approximately 165 feet wide to accommodate both the Delevan and TRR pipelines. A total of four 12-foot-diameter pipes would be installed from the TRR to Holthouse Reservoir. Trench side slopes would be approximately 1:1.5. No shoring would be installed under normal excavation conditions. Special conditions at some locations (unknown at this time) may require additional depth or width, or steeper or flatter side slopes, or shoring to accommodate localized soil conditions.

  The Delevan Pipeline trench would be excavated using trenchers and tracked and/ or wheeled excavators and backhoes, or pushed up using bulldozers. The type of soils encountered would determine the type of equipment used for trenching. Harder soils, such as caliche, would require larger trenchers. In specific areas, vacuum excavation, “pot-holing” with a backhoe or hand digging may be necessary to locate buried utilities.

  Excavation activities similar to the Delevan Pipeline excavation would also be done for electrical transmission pole footings that would be installed within the pipeline right-of-way. These activities would occur simultaneously with the pipeline excavation.

- **Dewatering –** Dewatering of the trench would be necessary in many locations and could be permitted to discharge into local irrigation ditches and drainage canals and/or the CBD after settling of silts. Silts would be disposed of with excavated material. Dewatering would be in accordance with CVRWQCB requirements and California Storm Water Quality Association BMPs for dewatering.

- **Bedding Preparation –** One foot of bedding material would be installed in the trench before installation of the pipeline. Bedding material would likely be sand, consolidated backfill, or cemented controlled density fill. The bedding material would be poured into the trench by dump truck, and spread along the bottom of the trench by a small grader or similar type of equipment.

- **On-Site Fabrication of Pipes –** All pipes would be fabricated on-site at the concrete batch plant. A fabrication and curing area for the pipes would be located within the 20-acre batch plant footprint. Pipes would be fabricated on-site from straight lengths of reinforcing steel.

- **Installation of Pipe and Valves –** The finished sections of the pipes would be transported from the concrete batch plant to the installation location primarily along the pipeline route on flatbed trucks traveling along the construction access roadway (within the construction disturbance area). These trucks would cross public roadways. Pipe sections would be offloaded from flatbed trucks and placed in the excavated pipeline trench by a 50-ton capacity crane. Once in place, the metal joining plates cast into the end of each pipe would be welded together and the joint would be covered with a cement-based sealing compound. At valve locations, pre-fabricated valves would be delivered to the site on flatbed trucks and installed into previously constructed structures within the trench using the same crane.

- **Backfill of Trench –** Approximately five million cubic yards of material would be needed to backfill the trench after the pipes are installed. Excavated material would be re-used to backfill the trench or moved to other Project locations for use, to the extent possible, after placement of pipes. Excess spoils from the excavation (estimated 1.3 million cubic yards) would be spread on adjacent agricultural lands of willing landowners within the 800-yard-wide corridor along the pipeline, used as backfill at the proposed Delevan Pipeline Intake Facilities, or placed in the proposed Sites Reservoir footprint. Excess spoils may also be used to reinforce existing levees in the area as part of a separate program, which would be subject to a separate environmental analysis. Re-use of excavated material may be limited by water content of excavated material and soil compaction requirements.

Operations. Operation of the proposed Delevan Pipeline would not require daily workers at the site.

Maintenance. Periodic inspection and maintenance of the proposed Delevan Pipleine would likely occur once per year, typically in the months of April and May, with possible additional inspections and maintenance needed after earthquakes or storm or flood events. Permanent rights-of-way for the land overlying the pipeline would be maintained to guarantee future access. Disturbed lands would be returned to agricultural production after pipeline construction.

3.1.4.5 Sites Pumping/Generating Plant (5,900-cfs)

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill the reservoir and to generate electricity during the release of water from Sites Reservoir to the Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The Sites Pumping/Generating Plant would have a total pumping capacity of 5,926 cfs and a release capacity of 5,100 cfs. Table 3-10 summarizes the pump and pump/turbine configuration for the 5,900-cfs Plant.

Table 3-10
Proposed Sites Pumping-Generating Plant Configuration for Alternative A

Unit Type	Number of Units	Net Head (ft)	Pumping Capacity (cfs)	Generating Capacity (cfs)	Total Pumping Capacity (cfs)	Total Generating Capacity (cfs)
Pump - Francis Vane (Dual Speed)	2 (+1 standby)	290	870	-	5,926	5,100
		162	870	-		
Pump - Francis Vane (Dual Speed)	2	290	435	-		
		162	435	-		
Pump/Turbine - Reversible Francis (Dual Speed)	4 (+1 standby)	290/270	663	1020		
		162/142	663	1020		
Pump/Turbine - Reversible Francis (Dual Speed)	2	290/270	332	510		
		162/142	332	510		

The Sites Pumping/Generating Plant has been designed as a conventional indoor-type pumping plant. The design includes an in-line arrangement of vertical pumping units with a reinforced concrete substructure and a steel superstructure. The size of each unit bay was determined based on the minimum required spacing between each unit. Two service bays have been incorporated on either side of the Sites Pumping/Generating Plant and have been sized to allow for two units to be serviced simultaneously while the remainder of the Sites Pumping/Generating Plant continues operation.

The pumps would be connected to a complex intake/outflow manifold. When water is drawn out of Holthouse Reservoir and pumped up to Sites Reservoir, the pumped water would flow through successive pipe connections until all eleven pipes coming from the pump units combine into a single 26-foot-diameter pipe. This pipe would then join the 26-foot-diameter pipe coming from the emergency bypass outlet, and the two pipes would connect to the 30-foot-diameter tunnel.

Additional proposed on-site facilities related to the Sites Pumping/Generating Plant include:

- Approach channel
- Pressure tunnel
- Emergency release bypass outlet
- Electrical switchyard
- Maintenance buildings
- Electrical connection
- Access roads

The Sites Pumping/Generating Plant would be connected to Holthouse Reservoir by an approximately 8,300 foot-long earthen approach channel (discussed in Section 3.1.1.9). On the other side of the Sites Pumping/Generating Plant, connecting the channel to Sites Reservoir, would be a 4,031-foot long, 30-foot-diameter tunnel (the tunnel is discussed in Section 3.1.1.6).An electrical switchyard (Sites Electrical Switchyard) would be required adjacent to the Sites Pumping/Generating Plant that would step down the electrical voltage from high voltage lines to a lower voltage that could be used by the pumps and other machinery in the plant.

Construction. The total site footprint of the proposed Sites Pumping/Generating Plant and approach channel would be approximately 75 acres. An additional 20 acres of land adjacent to the plant would likely be disrupted during construction.

Anticipated ground-disturbing activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Excavating the approach channel and pumping plant
- Dewatering
- Constructing the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. A SCADA system would control all of the different proposed operational modes. The system would be located on-site and would broadcast status information to a manned remote location. Plant operators would require continuous communication with the TRR Pumping/Generating Plant, Delevan Pipeline Intake Facilities, and T-C Canal operators to coordinate flows into and out of the proposed Holthouse Reservoir and Sites Reservoir for filling and releasing.

Maintenance. Routine maintenance and monitoring of the proposed Sites Pumping/Generating Plant would likely be required on a daily basis. Regular maintenance and inspection would have to be done for each pump unit and the related equipment, such as gates, valves, and electrical equipment. The Sites Pumping/Generating Plant would be equipped with cranes to facilitate operation and maintenance. There would be a 100-ton capacity indoor bridge crane for assembly and maintenance of pumping/generating units and associated equipment. A 50-ton capacity outdoor traveling gantry crane would be installed for assembly and maintenance of butterfly valves. In addition, a 10-ton capacity outdoor traveling gantry crane would be installed to aid in the installation and removal of inlet gates and trashracks.

3.1.4.6 Delevan Transmission Line

The proposed Delevan Transmission Line would carry electricity from an existing power source (PG&E 230-kV, WAPA 500-kV, or WAPA 230-kV transmission lines) to the proposed pumping/generating plants. The proposed electrical switchyard and transmission line that would connect the pumping/generating plants to the grid would provide all of the electricity needed by the pumping plants. The switchyard and transmission line would allow the pumping/generating plants to feed electricity back into the electrical grid during generation activities.

Each of these new pumping/generating plants would be connected to the existing electrical grid by the proposed 230-kilovolt (kV) overhead Delevan Transmission Line. Each pumping/generating plant would have a dedicated switchyard to step the transmission down to usable motor voltage. The Delevan Transmission Line would parallel the proposed Delevan Pipeline route from the proposed Delevan Pipeline Intake facilities to the proposed TRR within a 150-foot-wide permanent transmission line easement 150 feet north of the permanent easement for the proposed Delevan and TRR pipelines[9] (Figure 3-1). From the TRR at about the GCID Canal crossing, the Delevan Transmission Line would travel in a southwesterly direction for a length of approximately 9,600 feet to the proposed T-C Canal Discharge Dissipater at the northeastern tip of the proposed Holthouse Reservoir. From Holthouse Reservoir, the Delevan Transmission Line would travel in a northwesterly direction for approximately 3,600 feet and then travel west for approximately 5,300 feet, at which point the transmission line would cross the proposed Eastside Road. From Eastside Road, the Delevan Transmission line would travel in a southwesterly direction for approximately 1,700 feet to connect to the proposed Sites Electrical Switchyard.

In addition, lower voltage overhead distribution lines would be connected to the proposed Golden Gate Dam, Sites Dam, South Bridge, and Stone Corral, Peninsula Hills, and Lurline Headwaters recreation areas. Electricity provided to Golden Gate Dam would likely come from the Sites Pumping/Generating Plant site through an easement along Funks Creek to the dam. Electricity to Sites Dam, South Bridge, and the three recreation areas would likely come from an existing overhead distribution line that parallels Sites Lodoga Road. The power line would be extended to Sites Dam along the canyon walls, through the Stone Corral Recreation Area (following roads when available), along the new Stone Corral Road to the South Bridge, and along Sites Lodoga Road to the proposed Peninsula Road to the Peninsula Hills Recreation Area. From Sites Dam, the power line would be extended approximately 3.1 miles in a southwesterly direction to the Lurline Headwaters recreation area.

Construction. The proposed Delevan Transmission Line construction disturbance area would be approximately 410 acres. The construction disturbance area for the transmission line would be completely

[9] The transmission line cannot be constructed within the same permanent easement as the pipeline because the footprint of the transmission tower footings would impede access to the pipeline during future maintenance activities.

contained within the permanent easement along the transmission line. The permanent easement would be approximately 150 feet wide along the entire alignment.

A portion of the existing agricultural fields within the transmission line alignment would be fallowed and not watered during construction of tower footings and placement of towers. A corridor approximately 150 feet wide would be needed for construction activities, staging areas, and stockpile areas. Anticipated major construction activities include clearing and grading the construction workspace; placing necessary construction materials at staging areas; excavating and constructing tower footings; erecting the transmission towers; and stringing the conductor.

The transmission line would cross an existing PG&E natural gas pipeline and transmission line. The pipeline crossing would be accomplished by siting the towers away from the pipeline. The crossing of high voltage lines requires special precautions during construction, and has specific design requirements to maintain minimum clearances from each other under conservative line operating conditions. At this crossing location, the proposed transmission line towers would be constructed approximately twelve feet higher than the typical transmission pole or tower height to ensure that minimum design and utility requirements are met.

The transmission line would be an above-ground feature, with the footings of the transmission towers resulting in a permanent change in land use and loss of wildlife habitat. Assuming a worst-case scenario of 70 transmission towers, each with a concrete pad for a base, over the entire length of the transmission line, the total permanent acreage that would change land use and result in habitat loss would be approximately 2.5 acres of a combination of rice and annual grassland habitat.

Operations. Operation of the proposed Delevan Transmission line and associated distribution lines would be an unmanned activity.

Maintenance. The proposed Delevan Transmission Line and associated distribution lines would require only periodic maintenance (once or twice a year), which would include equipment inspections and vegetation maintenance.

3.1.5 Alternative B—Proposed Facilities Unique to Alternative B

Alternative B would focus on meeting the proposed Project's primary objectives by constructing a proposed 1.81-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion) to convey water to the proposed Sites Reservoir, and a proposed release-only Delevan Pipeline (1,500-cfs release) to convey water from the reservoir. Alternative B would use the common features described in Section 3.1.1, in addition to the features described below.

3.1.5.1 1.81-MAF Sites Reservoir Inundation Area

Similar to the proposed 1.27-MAF Sites Reservoir discussed in Section 3.1.4.1, the proposed 1.81-MAF Sites Reservoir would be located approximately 10 miles west of the town of Maxwell (Figure 3-1). This reservoir configuration would have a storage capacity of 1.81 MAF, a maximum water surface elevation of 520 feet above msl (the minimum operating water surface would be at elevation 340 feet), and an inundation area of approximately 14,000 acres. The inundation area of the proposed 1.81-MAF Sites Reservoir would be created by filling Antelope Valley after the construction of 11 dams. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, and nine saddle dams on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (all dams are discussed further in Section 3.1.5.2).

Many areas within Sites Reservoir Inundation Area would be used for staging of materials and equipment prior to and during construction of other proposed Project components (e.g., the Sites Reservoir dams).

Construction. The total construction disturbance area would be approximately 15,720 acres, consisting of the proposed inundation area footprint and a temporary construction disturbance area. Anticipated ground-disturbing activities during construction include clearing and grubbing, and demolition and removal of existing structures, such as residential dwellings, barns, and miscellaneous structures.

- **Clearing and Grubbing.** Ninety-two percent of the proposed reservoir inundation area footprint is composed of annual grasslands; as a result, clearing and grubbing would not be needed in this area. The remaining eight percent consists of blue oak woodland, agricultural crops, and other vegetation, which would be cleared.
- **Demolition of Existing Structures.** Twenty-two houses and four detached garages, one mobile home, 26 barns, and 37 other structures (combination of sheds, silos, and a pump house) within the proposed Sites Reservoir Inundation Area would be demolished. Existing septic tanks and other storage tanks would also be removed. In addition, many miles of fencing and asphalt would be removed, erosion protection may be needed for midden locations, and elderberry shrubs may need to be removed from their existing location and relocated. Demolition debris would likely be transported and disposed of at a landfill that is permitted to accept such waste.
- Two cemeteries would be relocated.

Operations. Operations of the proposed 1.81-MAF Sites Reservoir are the same as for the proposed 1.27-MAF reservoir (Section 3.1.4.1).

Maintenance. Maintenance of the proposed 1.81-MAF Sites Reservoir is the same as for the proposed 1.27-MAF reservoir (Section 3.1.4.1).

3.1.5.2 Dams for the 1.81-MAF Sites Reservoir

Eleven dams would be needed to create the proposed 1.81-MAF Sites Reservoir (Figure 3-1). The reservoir would be formed by the proposed Golden Gate Dam, Sites Dam, and nine saddle dams along the northern perimeter of the reservoir between the Funks Creek and Hunters Creek watersheds, near the Glenn-Colusa County line. Golden Gate Dam would be constructed on Funks Creek, approximately one mile west of Funks Reservoir. Sites Dam would be constructed on Stone Corral Creek, approximately 0.25 mile east of the town of Sites and ten miles west of the town of Maxwell. Saddle Dam Nos. 1, 2, 4, and 9 are generally characterized as small-sized dams, with heights ranging from approximately 40 to 50 feet. Saddle Dam Nos. 3, 5, 6, 7, and 8 are generally characterized as medium-sized dams, with heights ranging from approximately 70 to 130 feet. Saddle Dam Nos. 3, 5, and 8 are the tallest and largest of the nine proposed saddle dams, with embankment volumes of approximately 3.5, 1.5, and 1.9 million cubic yards, respectively.

The 11 dams would be constructed as zoned earth rockfill embankment dams, and are designed to be constructed primarily of on-site materials. Site topography, geology, seismicity, and foundation features were considered when selecting the dam alignments, design, and sections. The dam designs would conform to modern economic construction practices and incorporate conservative design measures.

Table 3-11 lists the proposed height and length of the 11 dams as well as the total volume of materials needed to construct the dam embankments.

Table 3-11
Characteristics of the Proposed Sites Reservoir Dams for Alternatives B and C

Dam	Maximum Height Above Base* (feet)	Crest Length (feet)	Total Embankment Volume (cubic yards)
Sites Dam	290	850	3,836,000
Golden Gate Dam	310	2,250	10,590,000
Saddle Dam No. 1	50	490	93,000
Saddle Dam No. 2	80	420	86,000
Saddle Dam No. 3	130	3,810	3,577,000
Saddle Dam No. 4	40	270	18,000
Saddle Dam No. 5	100	2,290	1,505,000
Saddle Dam No. 6	70	530	144,000
Saddle Dam No. 7	75	1,040	196,000
Saddle Dam No. 8	105	2,990	1,915,000
Saddle Dam No. 9	45	340	49,000
Total			**22,009,000 cubic yards**

*Base is defined as ground surface elevation.

The crest elevation of all 11 dams would be 540 feet, providing 20 feet of freeboard. Sites and Golden Gate dams would have crest widths of 30 feet and embankment slopes of 2.25:1 upstream and 2:1 downstream. The saddle dams would have crest widths of 20 feet and embankment slopes of 3:1 upstream and 2.5:1 downstream.

Saddle Dams 2, 3, and 5 would have fairly flat slopes on the left abutments[10] which require low dam heights (less than approximately 10 feet high). At these locations, the dam embankments would be strictly providing residual freeboard. Therefore, the typical saddle dam sections would be replaced at these locations with a small homogenous impervious embankment with a bentonite slurry wall for foundation seepage control. The crest elevation and width and slopes of the homogeneous embankment would match that of the saddle dams. Construction of the slurry wall configuration is a more economical option than construction of the typical embankment and excavation section. The slurry wall would be excavated to a depth corresponding to the moderately weathered bedrock surface, with average dimensions estimated at 20 feet deep by five feet wide. At the left abutment of Saddle Dam No. 2, the slurry wall section would also provide a defensive measure to control foundation seepage in the event that displacement occurs along the Salt Lake Fault. At this location, the slurry wall was extended to a depth of 40 feet to minimize the potential of foundation seepage along the fault zone.

The proposed emergency spillway at the proposed 1.81-MAF Sites Reservoir would be located at Saddle Dam No. 6. The purpose of the emergency spillway would be to release excess water as the result of overpumping after a probable maximum flood (PMF), and to prevent overtopping the dams. If the PMF were to occur when the reservoir was at maximum pool (elevation 520.0 feet), the water surface elevation

[10] Abutment direction refers to looking downstream. Therefore, the dam's left abutment would be the abutment on the left side of the dam when looking downstream.

would rise to 525.2 feet (with no reservoir releases). The dam crest elevation would be 540.0 feet. Therefore; the emergency spillway would be required only in the event that water was still being pumped into the reservoir after the PMF had been stored (an unlikely occurrence).

For the proposed 1.81-MAF Sites Reservoir, a proposed morning glory spillway[11] would be provided on a cut bench on the left abutment of the saddle dam. The outlet pipe would be installed under the dam on a cut bench on the dam abutment foundation. On the downstream side of the dam, the pipe would be installed downslope to the creek. An energy dissipating structure would be located at the end of the pipeline to control the discharge of water to the creek. The spillway would consist of one seven-foot-diameter concrete pipe sized primarily for inspection and maintenance activities. The spillway pipe inflow elevation would be set at 525.5 feet, 5.5 feet above normal maximum pool.

The 11 dams would be constructed of compacted excavated materials (soil and rock). The four zones of the embankment dams would be constructed as described for the proposed 1.27-MAF Sites Reservoir (Section 3.1.4.2).

Construction. The total construction disturbance area for the 11 proposed dams would consist of approximately 160 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, borrow areas, and access roads. The construction disturbance area for the dams would be within the construction disturbance area for the proposed reservoir inundation area.

All other proposed construction activities would be the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

Operations. All proposed operations activities are the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

Maintenance. All proposed maintenance activities are the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

3.1.5.3 Delevan Pipeline – 1,500-cfs Release Only

The approximately 13.5-mile-long release-only Delevan Pipeline would convey water from the proposed Holthouse Reservoir to the Sacramento River for releases. The portion of the proposed Delevan Pipeline that would be to the west of the proposed TRR would parallel the proposed TRR Pipeline from the TRR to Holthouse Reservoir, and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-1).

The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. The pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

The Delevan Pipeline would begin at the proposed Delevan Pipeline Discharge Facility at the Sacramento River. The Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would be aligned southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

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[11] A morning glory spillway is an uncontrolled spillway with a funnel-shaped outlet that allows water to spill into the funnel rather than spilling over the dam.

The proposed alignment of the Delevan Pipeline would require five major crossings (SR 45, SR 99, I-5, Union Pacific Railroad, and the GCID Canal). The proposed pipeline route would also cross the easement for the PG&E 230-kV electrical transmission line and a major PG&E natural gas pipeline. Other existing infrastructure that the Delevan Pipeline could potentially cross include: gas lines, water lines, sewer lines, communications lines, and other infrastructure. These major crossings would be accomplished with the jack and bore construction method.

In addition, the proposed Delevan Pipeline would cross the CBD. The crossing location would be at the northern end of the drain.

Construction. All construction activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

Operations. All operations activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

Maintenance. All maintenance activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

3.1.5.4 Delevan Pipeline Discharge Facility

Because Alternative B does not include the proposed Delevan Pipeline Intake Facilities, a separate release structure would be required at the Sacramento River to make controlled releases to the river. The proposed release structure (Delevan Pipeline Discharge Facility, Figure 3-13C) would be located at the same site as shown for the Delevan Pipeline Intake Facilities (Figure 3-13A). The diameter of the proposed Delevan Pipeline would be reduced in stages from 12-foot diameter to eight foot, then to four foot before reaching the proposed energy dissipating valve house. The valve house would be located just above the design Sacramento River flood level at the site, which is at an approximate elevation of 82 feet.

The energy dissipating valves would be 48-inch-diameter fixed cone valves located in confining vaults to control excessive spray and help dissipate the energy. From the valve structure, released water would flow down a short channel section before reaching a proposed baffle block spillway leading down to the river. The system is designed for a maximum release flow of 1,500 cfs. The baffle block spillway could control the release of water to the river regardless of the river level and provide aeration benefits.

The valve house, channel, and spillway would be located within the current river overbank area so that the facilities do not encroach within the flow area when the river is at its maximum design level. The downstream side of the spillway exposed to the river would be fitted with fish barrier racks to prevent migrating adults fish from entering the spillway chute. The clear spacing of the bars in the rack would be 1.5 inches.

At the maximum design flow, the width of the spillway structure would be designed to maintain the release velocity from the structure at or below two fps at the minimum river design level at an elevation of 51 feet.

The proposed Delevan Pipeline Discharge Facility would be located in a reach of the Sacramento River that is protected by a federal project levee system administered by U.S. Army Corps of Engineers (USACE) and the Central Valley Flood Protection Board. The top of the levee in the proposed Project area is at an elevation of 90 feet. Before the levee is breached and construction begins on the valve house and spillway, a setback levee would be constructed around the site. The setback levee would tie into the existing levee on the north and south sides of the site so that there is no interruption of flood protection during proposed Project construction. In addition, current levee regulations do not permit piping to pass through or under Project levees. For this reason, the piping would be elevated where it crosses the setback levee so that it is above elevation 90.0.

Construction. The total construction disturbance area would be approximately 7.7 acres. An additional area around the proposed construction site would be required for staging of materials, equipment, and construction offices. This area would be within the construction disturbance area for the proposed Delevan Pipeline. To isolate the construction area from the Sacramento River, a cellular sheet pile coffer dam would be installed in the river near the location of the discharge facility. Approximately 350 feet of sheet piles would be required to build the coffer dam. The coffer dam would extend approximately five to 10 feet into the water from the river bank. Installation of the coffer dam would involve driving interlocking metal sheet piles into the ground one section after another until the entire length of the intake structure is isolated from the river. The height of the coffer dam would match the height of the surrounding levees. The coffer dam is likely to remain in place throughout the duration of facility construction. The area behind the coffer dam would be dewatered prior to construction by pumping water out from behind the coffer dam. After construction of the discharge facility is complete, the coffer dam would be removed by pulling the sheet piles out of the river.

Construction of the proposed Delevan Pipeline Discharge Facility would include the following:

- Constructing the setback levee along with any slurry walls that might be required to control through seepage and under seepage.
- Constructing a coffer dam along the shore of the river to permit spillway construction in dry conditions.
- Excavation of the bank and backfilling of the area to construct the spillway, channel, and valve house. Approximately 6,000 cubic yards of excavation would be required.
- Backfilling around the structures and on the water side of the setback levee, as required.
- Placing rip rap rock slope protection for a minimum of 100 feet upstream and downstream of the spillway to control erosion.
- Site revegetation.

Operations. Proposed release operations would be such that a maximum 1,500 cfs would be discharged to the river channel. A SCADA system would control all of the different operational modes. The system would be located on-site and would broadcast status information to a manned remote location. The SCADA systems provide a means to control the release without staffing the on-site facilities.

Maintenance. The proposed Delevan Pipeline Discharge Facility would likely be staffed daily to maintain, operate, and monitor the facility. It is anticipated that employees would be on-site during release (predominantly in summer) activities.

3.1.5.5 Sites Pumping/Generating Plant (3,900-cfs)

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill it and to generate electricity during the release of water from Sites Reservoir to the Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The proposed Sites Pumping/Generating Plant would have a total pumping capacity of 3,916 cfs and a release capacity of 5,100 cfs. Table 3-12 summarizes the pump and pump/turbine configuration for the 3,900-cfs Plant.

Table 3-12
Proposed Sites Pumping-Generating Plant Configuration for Alternative B

Unit Type	Number of Units	Net Head (Feet)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per unit (cfs)	Total Plant Pumping Capacity (cfs)	Total Plant Generating Capacity (cfs)
Pump – Francis Vane Dual Speed	2 (+1 Standby)	323	300	-	3,916	5,100
		195	300	-		
Pump/Turbine Reversible Francis, Dual Speed	4 (+1 Standby)	323/310	663	1,020		
		195/182	663	1,020		
Pump/Turbine Reversible Francis, Dual Speed	2	323/310	332	510		
		195/182	332	510		

The proposed Sites Pumping/Generating Plant has been designed as a conventional indoor-type pumping plant. The design includes an in-line arrangement of vertical pumping units with a reinforced concrete substructure and a steel superstructure. The size of each unit bay was determined based on the minimum required spacing between each unit. Two service bays have been incorporated on either side of the proposed Sites Pumping/Generating Plant and have been sized to allow for two units to be serviced simultaneously while the remainder of the plant continues operation.

The pumps would be connected to a complex intake/outflow manifold. When water would be drawn out of the proposed Holthouse Reservoir and pumped up to the proposed Sites Reservoir, the pumped water would flow through successive pipe connections until all eleven pipes coming from the pump units combine into a single 26-foot-diameter pipe. This pipe would then join the 26-foot-diameter pipe coming from the emergency bypass outlet, and the two pipes would connect to the 30-foot-diameter tunnel.

Additional proposed on-site facilities related to the proposed Sites Pumping/Generating Plant include:

- Approach channel
- Pressure tunnel
- Emergency release bypass outlet
- Electrical switchyard
- Maintenance buildings
- Electrical connection
- Access roads

The proposed Sites Pumping/Generating Plant would be connected to the proposed Holthouse Reservoir by an approximately 8,300 foot-long earthen approach channel (approach channel is discussed in

Section 3.1.1.9). On the other side of the pumping plant, connecting the channel to the proposed Sites Reservoir, would be an approximately 4,030-foot-long, 30-foot-diameter tunnel (discussed in Section 3.1.1.6).

An electrical switchyard (Sites Electrical Switchyard) would be required adjacent to the proposed Sites Pumping/Generating Plant that would step down the electrical voltage from high voltage lines to a lower voltage that could be used by the pumps and other machinery in the plant.

Construction. The total proposed footprint of the proposed Sites Pumping/Generating Plant and approach channel would be approximately 75 acres. An additional 20 acres of land adjacent to the proposed Sites Pumping/Generating Plant would likely be disrupted during construction.

Anticipated ground-disturbing activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Excavating the approach channel and pumping plant
- Dewatering
- Constructing the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. All proposed operations activities would be the same as described for the proposed 1.27-MAF Sites Reservoir pumping/generating plant (Section 3.1.4.5).

Maintenance. All proposed operations activities are the same as described for the proposed 1.27 MAF Sites Reservoir pumping/generating plant (Section 3.1.4.5).

3.1.5.6 Delevan Transmission Line

The proposed Delevan Transmission Line would carry electricity from an existing power source (PG&E 230-kV or WAPA 500-kV or WAPA 230-kV power lines) to the proposed Sites and TRR pumping/generating plants. Alternative B does not include a pump station at the Delevan Pipeline Intake. The transmission line would be the same as described in Section 3.1.4.6 for Alternative A, except there would be no transmission line between the proposed Delevan Pipeline Intake Facilities and the proposed TRR. There would be a slight difference in the alignment of the transmission line on the eastern edge of the proposed Sites Reservoir to the northernmost proposed recreation area (Saddle Dam Recreation Area) due to the differences in reservoir size and proposed Golden Gate Dam location between Alternatives A and B.

Construction. Construction of this facility would be the same as described in Section 3.1.4.6. However, the construction disturbance area for the transmission line would be approximately 100 acres because Alternative B does not include a transmission line between the proposed Delevan Pipeline Intake Facilities and the proposed TRR.

The proposed footings of the transmission towers would result in a permanent change in land use and loss of wildlife habitat. Assuming a worst-case scenario of 15 transmission towers, each with a concrete pad for a base for the length of the transmission line, the total permanent acreage that would change land use and result in a habitat loss would be approximately 0.5 acre of annual grassland habitat.

Operations. Operation of this proposed facility would be the same as described in Section 3.1.4.6.

Maintenance. Maintenance of this proposed facility would be the same as described in Section 3.1.4.6.

3.1.6 Alternative C—Proposed Facilities Unique to Alternative C

Alternative C would focus on meeting the proposed Project's primary objectives by constructing a proposed 1.81-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion), and a proposed Delevan Pipeline (2,000-cfs diversion/1,500-cfs release), to convey water to and from the reservoir. Alternative C would use the common features described in Section 3.1.1, in addition to other features already described for Alternatives A and B.

Alternative C combines several of the unique proposed features of Alternatives A and B, including

- Proposed 1.81-MAF Sites Reservoir Inundation Area – Same as Alternative B (Section 3.1.5.1)
- Proposed 1.81-MAF Sites Reservoir Dams – Same as Alternative B (Section 3.1.5.2)
- Proposed Delevan Pipeline Intake Facilities– Same as Alternative A (Section 3.1.4.3)
- Proposed Delevan Pipeline—2,000-cfs Diversion/1,500-cfs Release – Same as Alternative A (Section 3.1.4.4)
- Proposed Sites Pumping/Generating Plant (5,900-cfs) – Same as Alternative A (Section 3.1.4.5), except for the net head. The maximum water surface elevation for Alternative C would be approximately 40 feet higher than for Alternative A so the net head for the pumps and pump/turbines would be slightly larger compared to Alternative A. Table 3-13 summarizes the pump and pump/turbine configuration for the proposed 5,900-cfs Sites Pumping/Generating Plant.
- Proposed Delevan Transmission Line – The electrical transmission line for Alternative C would be similar to Alternative A (Section 3.1.4.6) with a slight difference in the alignment on the eastern edge of the proposed Sites Reservoir to the northernmost proposed recreation area (Saddle Dam Recreation Area) due to differences in reservoir size and the proposed Golden Gate Dam between Alternatives A and C.

Table 3-13
Proposed Sites Pumping-Generating Plant Configuration for Alternative C

Unit Type	Number of Units	Net Head (Feet)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per unit (cfs)	Total Plant Pumping Capacity (cfs)	Total Plant Generating Capacity (cfs)
Pump – Francis Vane Dual Speed	2 (+1 Standby)	330	870	-	5,926	5,100
		202	870	-		
Pump – Francis Vane Dual Speed	2	330	435	-		
		202	435	-		
Pump/Turbine Reversible Francis, Dual Speed	4 (+1 Standby)	330/310	663	1,020		
		202/182	663	1,020		
Pump/Turbine Reversible Francis, Dual Speed	2	330/310	332	510		
		202/182	332	510		

3.2 Proposed Project Construction

Proposed Project construction is expected to last for more than eight years for any of the action alternatives. Several factors affect this schedule, including funding, environmental compliance, material and equipment availability, labor force constraints, and access road capacity limitations. Additional adjustments to the schedule would be required as the proposed Project moves forward.

At the peak of proposed Project construction, the construction labor force is expected to be approximately 400 workers. Table 3-14 provides a list of the typical construction equipment expected to be present on-site during construction of the major proposed facilities and estimated equipment days.

Construction activities are anticipated to occur between the hours of 6:00 a.m. and 7:00 p.m. Monday through Friday. Nighttime and weekend construction may occur on an as-needed basis. If nighttime construction is determined to be needed, construction lighting consistent with applicable federal, State, and local requirements would be used. Nighttime construction would not be conducted between the hours of 10:00 p.m. and 7:00 a.m. within 1,000 feet of occupied residences. Haul times through residential communities would be limited to the hours of 7:00 a.m. to 10:00 p.m. with air brake restrictions in residential communities.

Construction activities associated with the proposed Project would be confined to designated construction disturbance areas. Construction vehicles and equipment would also be parked within these construction disturbance areas. In addition, construction materials would be stored within the construction disturbance areas. Special or sensitive sites within the construction disturbance areas where construction equipment and materials would not be allowed would be clearly marked and fenced with orange barrier fencing before any construction or surface-disturbing activity begins. Construction personnel would be trained to recognize these markers and understand the equipment movement restrictions involved. Lath, fencing, or flags would be maintained until final cleanup and/or site restoration is completed, after which they would be removed.

3.2.1 Access Routes

Traffic-generating construction activities associated with the proposed Project would include trucks hauling equipment and materials to and from the work sites and the daily arrival and departure of the construction workers. Construction traffic on local roadways would include dump trucks, concrete trucks, and other delivery trucks. Dump trucks would be used for earth-moving and clearing, removal of excavated material, and import of other structural and paving materials. Other trucks would deliver heavy construction equipment, job trailer items, concrete forming materials, piping materials, piles, new facility equipment, and other miscellaneous deliveries.

The following are typical construction access routes to some of the major proposed Project features (routes are illustrated on Figures 3-3A and 3-3B):

3.2.1.1 Sites Reservoir Inundation Area

Central Reservoir Area

- From I-5, travel west on Maxwell Sites Road.

Table 3-14
Estimated Equipment Days for Construction of Proposed Project Features Included in the Action Alternatives

Equipment	Dams and Sites Reservoir Inundation Area	Recreation Areas	Gravel Roads	Paved Roads and Bridges	Sites P/G Plant, Tunnel, and Sites Inlet/Outlet Structure	Funks Reservoir Sediment Removal	Funks Reservoir and Holthouse Reservoir Complex	Pump Installation at the Red Bluff Pumping Plant	GCID Camal Facilities Modifications	TRR	TRR P/G Plant	TRR and Delevan Pipelines	Transmission Lines and Electrical Switchyards	Delevan Pipeline Intake/Discharge Facilities and P/G Plant	Field Office Maintenance Yard
		Equipment Days													
Backfill loader	-	-	-	-	-	-	149	-	-	-	-	934	-	-	-
Batch plant equipment	-	-	-	-	-	-	-	-	-	-	104	-	64	104	-
Bulldozer	17,740	116	279	9,770	1,760	1,336	13,650	-	32	852	1,165	3,086	8	1,165	240
Compactor	15,350	-	156	-	-	-	796	-	159	66	200	934	-	200	160
Concrete material trucks	1,720	-	-	-	-	-	472	-	-	-	-	224	-	-	160
Concrete pump	-	-	-	-	306	-	22	-	-	-	104	-	29	104	80
Concrete trucks	648	66	-	2,246	1,030	-	176	-	156	-	416	83	154	416	-
Crane	-	-	-	1,000	350	-	-	-	-	-	200	1,500	474	200	-
Drilling machine	1,952	-	-	-	-	-	85	-	-	-	-	-	95	-	-
Dump truck	830	474	123	6,775	600	-	8	-	768	-	1,250	8,670	14	1,250	-
Excavator loader	-	-	-	-	-	-	-	-	-	152	-	400	-	-	-
Excavator	-	-	-	26	-	-	-	-	-	-	-	400		-	360
Filter material loader	3,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fork lift	89	121	-	-	510	-	59	40	-	140	400	1,500	82	400	480
Fuel truck	3,548	312	93	1,126	552	167	570	-	335	185	333	967	57	333	-
Generator	81	33	-	500	200	-	22	80	156	-	104	583		104	-
Grader	7,675	28	104	2,104	572	-	398	-	-	33	200	467	40	200	-
Grout pump	1,952	-	-	-	-	-	170	-	-	-	-	-	-	-	-
Highway trucks	45,328	282	-	1,291	1,172	16	4,036	-	680	700	1,760	5,190	810	1,760	720
Jacking equipment	-	-	-	-	-	-	-	-	-	-	-	600	-	-	-

Table 3-14
Estimated Equipment Days for Construction of Proposed Project Features Included in the Action Alternatives

Equipment	Dams and Sites Reservoir Inundation Area	Recreation Areas	Gravel Roads	Paved Roads and Bridges	Sites P/G Plant, Tunnel, and Sites Inlet/Outlet Structure	Funks Reservoir Sediment Removal	Funks Reservoir and Holthouse Reservoir Complex	Pump Installation at the Red Bluff Pumping Plant	GCID Camal Facilities Modifications	TRR	TRR P/G Plant	TRR and Delevan Pipelines	Transmission Lines and Electrical Switchyards	Delevan Pipeline Intake/Discharge Facilities and P/G Plant	Field Office Maintenance Yard
		Equipment Days													
Loader	-	158	41	1,235	400	-	-	-	192	-	125	-	103	125	-
Material trucks	-	-	-	-	2,736	-	-	-	-	-	-	-	-	-	160
Mobile Crane	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-
Off-road trucks	27,840	-	-	4,569	-	-	1,490	-	-	1,520	-	-	-	-	-
Paving machine	-	22	5	80	-	-	-	-	33	20	-	-	-	-	160
Pipe fabrication equipment	-	-	-	-	-	-	-	-	-	-	-	1,000	-	-	-
Pipe transport truck	-	-	-	-	-	-	-	-	-	-	-	1,100	-	-	-
Pull truck	-	-	-	-	-	-	-	-	-	-	-	-	192	-	-
Roller	-	50	10	925	-	-	-	-	66	-	-	-	-	-	-
Scissor lift	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
Scraper	6,800	-	147	8,736	3,090	2,672	11,460	-	138	652	1,165	13,734	-	1,165	-
Tunnel boring machine	-	-	-	-	200	-	-	-	-	-	-	-	-	-	-
Utility trucks	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-
Waste/tree loader	83	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Water trucks	7,096	144	191	2,252	352	334	2,280	-	205	215	466	967	101	466	360
Welding truck	-	-	-	-	294	-	-	-	-	-	-	-	-	-	-

Northern Reservoir Area

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and continue straight on proposed North Road (new permanent).

Southern Reservoir Area

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on Huffmaster Road.
- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent) (this is the detour during construction).

3.2.1.2 Sites Reservoir Dams

Sites Dam

- From I-5, travel west on Maxwell Sites Road.

Golden Gate Dam

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn right on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).

Saddle Dams

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent) for Saddle Dams 7, 8, and 9, or turn left from proposed North Road onto proposed Saddle Dam Road (new permanent) for Saddle Dams 1, 2, 3, 4, and 5, or turn left from proposed North Road onto proposed O&M road (new permanent)for Saddle Dam 6, or turn left from County Road 69 onto proposed Eastside Road (new permanent) and turn right on proposed O&M road (new permanent) for the Golden Gate Saddle Dam.
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent) and turn left on proposed O&M road (new permanent).

3.2.1.3 Recreation Areas

Saddle Dam

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent), and turn left on proposed Saddle Dam Road (new permanent).

Lurline Headwaters

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent, detour during construction).

Antelope Island

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on Huffmaster Road, and turn left on proposed construction road (new temporary).
- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on proposed Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and turn left on proposed construction road (new temporary).

Stone Corral

- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn left on proposed Stone Corral Road (new permanent), and turn left on proposed Stone Corral Recreation Area Road (new permanent).

Peninsula Hills

- From I-5, travel west on Maxwell Sites Road to Sites Lodoga Road, and turn right on proposed Peninsula Road (new permanent campground spur road).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn left on proposed Stone Corral Road (new permanent), across the proposed South Bridge (new permanent) onto Sites Lodoga Road, and turn right on proposed Peninsula Road (new permanent campground spur road).

3.2.1.4 Road Relocations and South Bridge

South Bridge

- From I-5, travel west on Maxwell Sites Road, and turn right on Peterson Road to reach central footings (this route is only available if the bridge is constructed before Sites Dam, which will block access on Maxwell Sites Road).
- From I-5, travel west on Maxwell Sites Road and continue straight on Sites Lodoga Road to reach the western approach/footings.
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), and turn left on proposed Stone Corral Road (new permanent) to reach the eastern approach/footings.

Com Road

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent, detour during construction), and turn right on proposed Com Road (new permanent).

Eastside Road

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

Sulphur Gap Road

- From I-5, travel west on Maxwell Sites Road, and turn left on proposed Sulphur Gap Road (new permanent).

North Road

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, and turn right on proposed Eastside Road (new permanent) and follow to proposed North Road (new permanent).

3.2.1.5 Sites Pumping/Generating Plant

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.6 Sites Electrical Switchyard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn right on proposed O&M road (new permanent).

3.2.1.7 Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn right on proposed O&M road (new permanent).

3.2.1.8 Sites Reservoir Inlet/Outlet Structure

- From I-5, travel west on Maxwell Sites Road, turn left onto proposed Sulphur Gap Road (new permanent), to proposed Lurline Road (new permanent), to Huffmaster Road, to Peterson Road.

3.2.1.9 Field Office Maintenance Yard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.10 Existing Funks Reservoir Dredging

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.11 Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), turn left on access road on south side of Funks Reservoir.
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent), turn right on access road on south side of Funks Reservoir.

3.2.1.12 Pump Installation at the Red Bluff Pumping Plant

- From I-5, exit South Main Street (in Red Bluff) and travel south (South Main Street becomes Hwy 99W). Turn left onto Altube Avenue; the TCCA office is on the left.

3.2.1.13 GCID Canal Facilities Modifications

Headgate

- From I-5, travel east on SR 32 and turn left on Canal Road.

Railroad Siphon

- From I-5 northbound, exit County Road 53; immediately turn left onto SR 99; proceed 1.13 miles north to the intersection of GCID. Turn right at GCID; the siphon is approximately 200 feet east of SR 99 to the Union Pacific Railroad Siphon.

3.2.1.14 GCID Canal Connection to the Terminal Regulating Reservoir

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.15 Terminal Regulating Reservoir

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.16 Terminal Regulating Reservoir Pumping/Generating Plant and Terminal Regulating Reservoir Electrical Switchyard

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.17 Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

- From I-5, travel west on Delevan Road turn left on Sutton Road, McDermott Road or County Road D.

3.2.1.18 Delevan Transmission Line

Eastern End:

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

Central Portion:

- From I-5, travel east on Maxwell Road, and turn left on Four Mile Road or Two Mile Road.
- From I-5, travel east on Delevan Road, and turn right on Four Mile Road or Two Mile Road.

Western Portion:

- From I-5, travel west on Delevan Road, and turn left on Sutton Road, McDermott Road, or County Road D.

3.2.1.19 Delevan Pipeline

Intake Facilities and Eastern End:

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

Central Portion:

- From I-5, travel east on Maxwell Road, and turn left on Four Mile Road or Two Mile Road.
- From I-5, travel east on Delevan Road, and turn right on Four Mile Road or Two Mile Road.

Western Portion:

- From I-5, travel west on Delevan Road, and turn left on Sutton Road, McDermott Road, or County Road D.

Far Western Portion:

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, and turn right on proposed Eastside Road (new permanent).

3.2.1.20 Delevan Pipeline Intake/Discharge Facilities

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

3.2.1.21 Borrow Areas (Generally Within the Sites Reservoir Inundation Area or Adjacent on Logan Ridge)

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn left on right on proposed Eastside Road (new permanent).

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on proposed Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and travel straight on Peterson Road.
- From I-5, travel west on Maxwell Sites Road.

3.2.2 Environmental Management Program during Proposed Project Construction

Certain preventative measures, plans, and Best Management Practices (BMPs) would be incorporated into the proposed Project to avoid or minimize potential impacts to the environment during construction. These actions are described below.

3.2.2.1 DWR Environmental Site Assessment

All property considered for purchase, transfer, retirement, or sale in fee or easement for the proposed Project by DWR must undergo an environmental site assessment to determine the existence of any hazardous substances. Water Resources Engineering Memorandum (WREM) No. 59a "Policy for Environmental Site Assessment and Remediation of Lands and Improvements for Hazardous Substance Contamination" identifies the requirements for the site assessment. The goals of WREM 59a are to minimize DWR's liability for hazardous substance contamination and remediation, ensure that site assessments and remedial actions are performed in accordance with all applicable federal, State, and local statutes and regulations, as well as accepted industry standards and practices, and ensure the proper storage, handling, transport, and disposal of designated and hazardous waste.

3.2.2.2 Construction Management Plan

A Construction Management Plan would be developed to avoid or minimize potential impacts to public health and safety during proposed Project construction. The Plan would inform contractors and subcontractors of work hours; modes and locations of transportation and parking for construction workers; location of overhead and underground utilities; worker health and safety; truck routes; stockpiling and staging procedures; public access routes; the terms and conditions of all Project permits and approvals; and emergency response services contact information. The Plan would also include construction notification procedures for the Police, Public Works, and Fire departments in the cities and counties where proposed Project construction would be carried out. Construction notices would also be distributed to neighboring property owners.

3.2.2.3 Permit Terms and Conditions

DWR and Reclamation would require contractors and suppliers, general contractors, and all of the general contractors' subcontractors and suppliers to comply with all terms and conditions of all Project permits and approvals, and conditions attached to them. Compliance with applicable laws, policies, and plans for the proposed Project is discussed in Chapter 4 Environmental Compliance and Permit Summary.

3.2.2.4 Stormwater Pollution Prevention Plan

The proposed Project is subject to construction-related stormwater permit requirements of the federal Clean Water Act (CWA) National Pollutant Discharge Elimination System Program. DWR and Reclamation would obtain required permits through the CVRWQCB before any Project-related ground-disturbing construction activity occurs. As required by the stormwater permit, a Stormwater Pollution Prevention Plan (SWPPP) would be prepared and implemented before construction starts and throughout the proposed Project construction period that identifies BMPs to prevent and minimize the introduction of contaminants into surface waters.

The objectives of the SWPPP would be to (1) identify pollutants and their sources associated with proposed Project construction activities that may impact stormwater quality and identify BMPs to reduce pollutants in stormwater discharges during and after construction, and (2) identify non-stormwater discharges and develop a plan to eliminate, control, or treat all non-stormwater discharges. BMPs would include site management practices (i.e., good “housekeeping”), non-stormwater management; erosion and sediment controls; and an inspection, monitoring, and maintenance program. BMPs for the proposed Project could include, but would not be limited to, silt fencing, straw bale barriers, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrances. The SWPPP would also include development of site-specific structural and operational BMPs to prevent and control impacts on runoff water quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means.

Other plans related to the SWPPP that would be prepared and implemented for the proposed Project include a Spill Prevention and Hazardous Material Management Plan, Erosion and Sediment Control Plan, and a Revegetation Plan.

Spill Prevention and Hazardous Materials Management

As part of the SWPPP, a Spill Prevention and Control Plan would be developed and implemented to minimize effects from spills of hazardous, toxic, or petroleum substances during construction of the proposed Project. The Spill Prevention and Control Plan would include measures to avoid the accidental release of chemicals, fuels, lubricants, and non-stormwater into channels. Spill prevention kits would always be in proximity when hazardous materials would be used (e.g., crew trucks and other logical locations). Feasible measures would be implemented so that hazardous materials would be properly handled by all reasonable means when working in or near any waterway. No fueling would be done within the ordinary highwater mark, immediate floodplain, or full pool inundation area, unless equipment would be provided so that any accidental fuel spill would not be able to enter the water, contaminate sediments that may come into contact with water, or damage wetland or riparian vegetation. Any equipment that was readily moved out of the channel would not be fueled in the channel or immediate floodplain. For all fueling of stationary equipment that is done at the construction sites, containments would be provided to the degree that any spill would not enter the channel or damage wetland or riparian vegetation. Equipment would not be serviced within the ordinary highwater mark or immediate floodplain, unless the equipment stationed in these locations could not be readily relocated (e.g., pumps, generators).

Additional BMPs designed to avoid spills from construction equipment and subsequent contamination of waterways would also be implemented. These may include, but not be limited to, the following:

- Storage of hazardous materials in double containment.
- Disposal of all hazardous and nonhazardous products in a proper manner.
- Monitoring of on-site vehicles for fluid leaks and regular maintenance to reduce the chance of leakage.
- Containment (a prefabricated temporary containment mat, a temporary earthen berm, or other measure can provide containment) of bulk storage tanks having a capacity of more than 55 gallons.

Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan would be prepared and implemented to control short-term and long-term erosion and sedimentation effects, and to restore soils and vegetation in areas affected by proposed Project construction activities. The Plan would include all necessary requirements regarding erosion control, and would implement BMPs for erosion and sediment control, as required. Types of BMPs may include, but would not be limited to, earth dikes and drainage swales, streambank stabilization, and use of silt fencing, sediment basins, fiber rolls, and sandbag barriers.

Revegetation Plan

A Revegetation Plan would be prepared to be implemented in conjunction with other management plans (e.g., the Erosion and Sediment Control Plan). The Plan applies to any area included as part of a proposed Project action alternative that is subject to relocation or mitigation activities. The Plan would include elements to control erosion through using proactive design techniques so that revegetation requirements would be integrated into grading plans to create favorable planting environments that would aid plant establishment and natural regeneration. The Plan would emphasize the use of adapted native plant species that are able to grow and perpetuate without artificial intervention and maintenance. Whenever feasible, local native plant species would be used. The overall objectives of the Plan would be to reestablish native vegetation to control erosion; provide effective ground cover; minimize opportunities for non-native plant species to establish or expand; and provide habitat diversity over time. DWR and Reclamation would work closely with cooperating agencies, private landowners, and revegetation specialists to develop the site-specific planting patterns and species assemblages necessary for a revegetation effort of this magnitude.

3.2.2.5 Fisheries Conservation

The measures discussed below would be implemented to minimize potential Project-related adverse impacts to fish species.

Implement In-Stream Construction Work Windows

All proposed instream Project-related construction work would be timed to occur when sensitive fish species would not be present or are least susceptible to disturbance. DWR and Reclamation would initiate consultation with NMFS, USFWS, and CDFW to identify appropriate instream construction work windows or other methods to minimize impacts to sensitive fish species.

3.2.2.6 Water Quality Protection Measures

The measures discussed below would be implemented to minimize potential Project-related adverse effects to water quality.

Implement Construction Work Windows

All proposed Project construction activities that would occur instream and adjacent to waterways would be conducted during seasonal time periods when erosion and siltation from equipment use are least likely to occur, or are minimal. DWR and Reclamation would initiate consultation with appropriate regulatory agencies to identify appropriate time periods and acquire necessary permits related to water quality protection.

Permits and Regulations and Orders

Proposed Project activities will be conditioned upon compliance with all permits, regulations, and orders related to water quality protection. Relevant permits anticipated to be obtained for the proposed Project include a California Fish and Game Code 1602 Lake and Streambed Alteration Agreement, Regional Water Quality Control Board (RWQCB) Section 401 certification or waiver, and CWA Section 404 compliance through USACE as well as requirements within the NMFS and USFWS Biological Opinions.

Water Quality Best Management Practices

BMPs that would be implemented to avoid and/or minimize potential impacts associated with proposed Project construction are discussed below.

- **Minimize Potential Impacts Associated with Equipment Contaminants.** For proposed in-water work, all equipment would be steamed clean every day to remove hazardous materials before the equipment entered the water.
- **Minimize Potential Impacts Associated with Access and Staging.** Existing access roads would be used to the extent possible. Proposed equipment staging areas would be located outside of the Sacramento River ordinary high water mark and away from sensitive resources.
- **Remove Temporary Fills as Appropriate.** Temporary fill, such as for access, side channel diversions, and/or side channel cofferdams, would be completely removed after completion of proposed construction.
- **Remove Equipment from the Waterbodies Overnight and During High Flows.** The construction contractor would remove all equipment from the water on a daily basis at the end of the work day. The construction contractor would also monitor Reclamation's Central Valley Operations Office website daily for forecasted river flows to determine and anticipate any potential changes in releases. If flows are anticipated to inundate a proposed work area that would normally be dry, the construction contractor would immediately remove all equipment from the work area.

Asphalt Removal

Pursuant to DFG Code 5650 Section (a), all asphalt roadways and parking lots inundated by the proposed Project would be demolished and removed according to local standards. Asphalt would be disposed of at an approved and permitted waste facility or recycled at the proposed Project asphalt plant. Dirt roads inundated by the proposed Project would remain in place.

3.3 Proposed Project Operations and Maintenance

Proposed Project operations and maintenance activities would include any activities that must occur to operate and maintain each proposed facility. Operation activities include those related to the movement of water (such as proposed Sites Reservoir level fluctuations, or the intake or release of water through the proposed Delevan Pipeline Intake or Discharge facility), the generation/transmission of electricity, the use of roads during operations and maintenance activities, and the recreation activities that would be associated with operations of Sites Reservoir.

Maintenance for the proposed Project facilities would consist of activities, such as debris removal, dredging, vegetation control, rodent control, erosion control and protection, routine inspections (dams, tunnels, pipelines, pumping/generating plants, inlet/outlet works, fence, signs, gates), painting, cleaning, repairs, and other routine tasks to maintain facilities in accordance with design standards after construction and commissioning. Routine visual inspection of the proposed facilities would be conducted to monitor performance and prevent mechanical and structural failures of Project elements. Maintenance activities associated with proposed river intakes could include cleaning, removal of sediments, debris, and biofouling materials. These maintenance actions could require suction dredging or mechanical excavation around intake structures; dewatering; or use of underwater diving crews, boom trucks or rubber wheel cranes, and raft- or barge-mounted equipment.

Proposed operations and maintenance activities could occur on a daily, annually, periodically (as needed), and long-term basis. It is estimated that 60 operations and maintenance workers, working 10-hour days, would be needed to perform operations and maintenance activities.

Table 3-15 shows the estimated equipment and hours of operation for operations and maintenance of the proposed Project facilities for the action alternatives.

3.4 References

California State Water Resources Control Board (SWRCB). 1999. Water Right Decision 1641. December.

National Marine Fisheries Service (NMFS). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. June 4. Southwest Region. Long Beach, CA.

U.S. Fish and Wildlife Service (USFWS). 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). December 15. Region 8. Sacramento, CA.

Table 3-15
Estimated Equipment Hours for Operation and Maintenance of Proposed Project Features Included in the Action Alternatives

Equipment	Reservoirs, Recreation Facilities, Dams, Roads, Bridges		Intake and Outlet Facilities, Pumping and Generating Plants		Electrical Switchyards and Transmission Lines		Tunnels and Pipelines		Estimated Total Hours/Yr of Use per Type of Equipment
	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	
Backhoe	4	520	1	520	1	20	1	10	1,070
Bobcat	1	520	1	520	1	20	1	10	1,070
Bulldozer	2	520	1	520	1	20	1	10	1,070
Crane	0	0	1	40	0	0	0	0	40
Dump Truck	3	1040	1	260	0	0	1	10	1,310
Excavator	1	24	0	0	0	0	0	0	24
Portable Generator	4	100	4	100	0	0	4	100	1,200
Grader	1	16	1	16	0	0	0	0	32
4WD Vehicle	10	1400			2	20	2	20	2,880
4WD Vehicle	10	3650	2	3650	0	0	0	0	14,600
Tractor Mower	2	520	2	520	1	20	1	10	2,110
Motor Boat	3	780	1	520	0	0	1	10	2,090
Boat-Operated Dredge		*		*				*	
ATV	4	200							200
Sedans	4	1000							1,000
Pump truck		150							150
Fork lift	3	500							500
Front End Loader	1	300							300
Air compressor	2	50		50					50

Table 3-15
Estimated Equipment Hours for Operation and Maintenance of Proposed Project Features Included in the Action Alternatives

Equipment	Reservoirs, Recreation Facilities, Dams, Roads, Bridges		Intake and Outlet Facilities, Pumping and Generating Plants		Electrical Switchyards and Transmission Lines		Tunnels and Pipelines		Estimated Total Hours/Yr of Use per Type of Equipment
	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	
Water truck	1	250							250
Flatbed/Boom truck	2	250	1	250					500
Portable welders	2	200	1	100			1	100	400
Scissor lift	1	150	1	50					200
Longer Term Maintenance	One dredge and 1 dump truck for 60 hours every 7 -10 years	One dredge, 1 crane, and 1 dump truck for 250 hours every year							250

Figures

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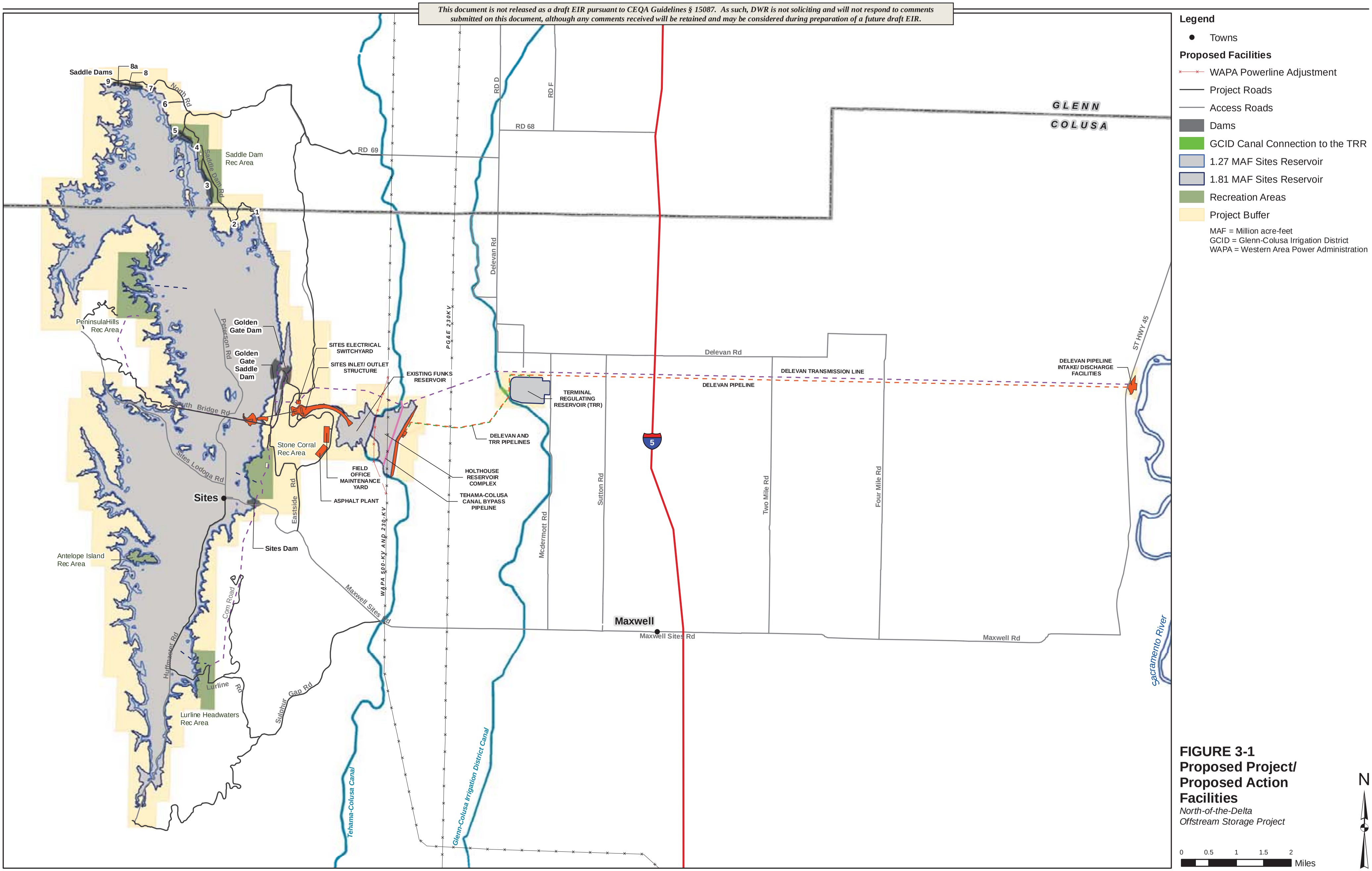

FIGURE 3-1
Proposed Project/ Proposed Action Facilities
North-of-the-Delta Offstream Storage Project

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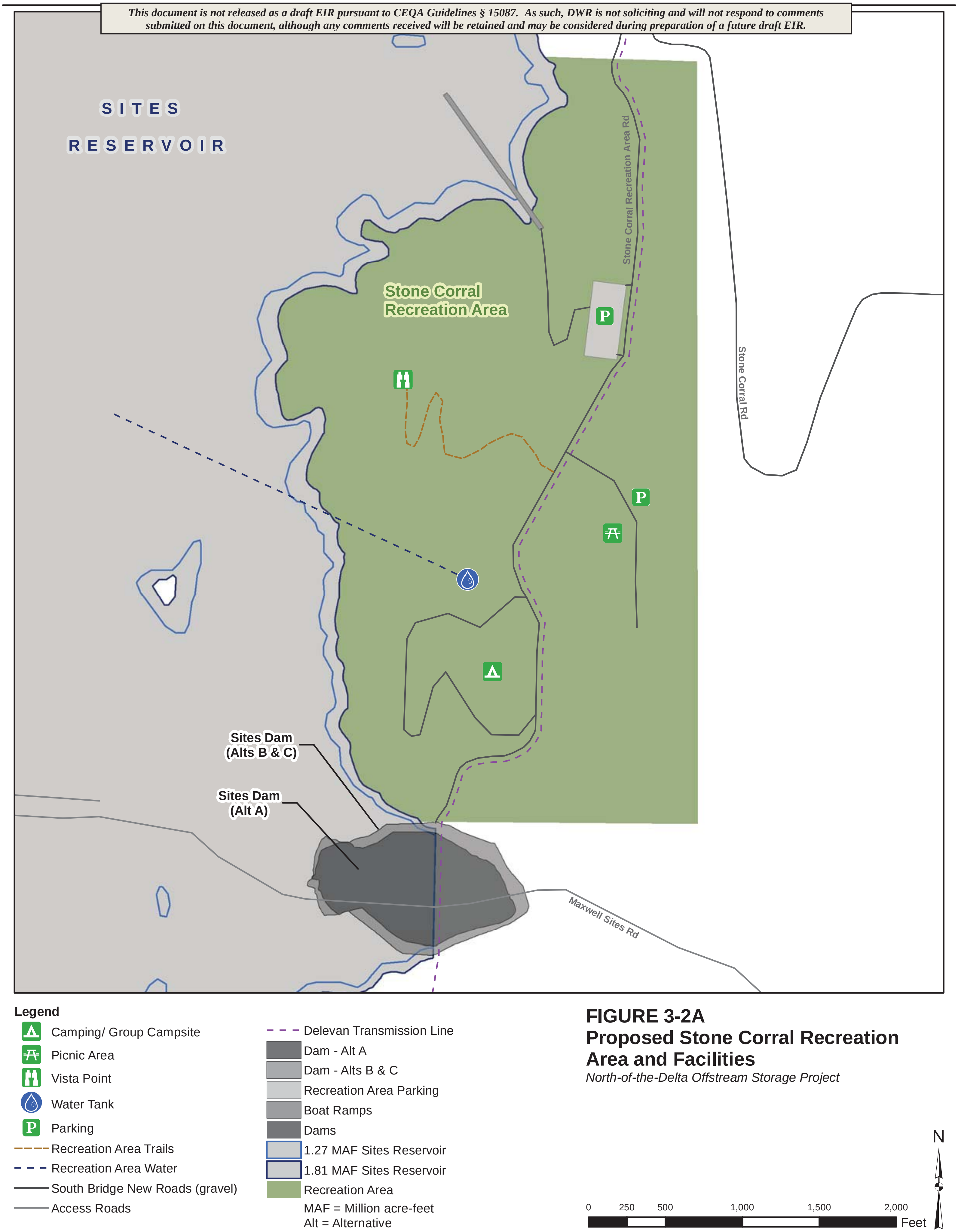

FIGURE 3-2A
Proposed Stone Corral Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

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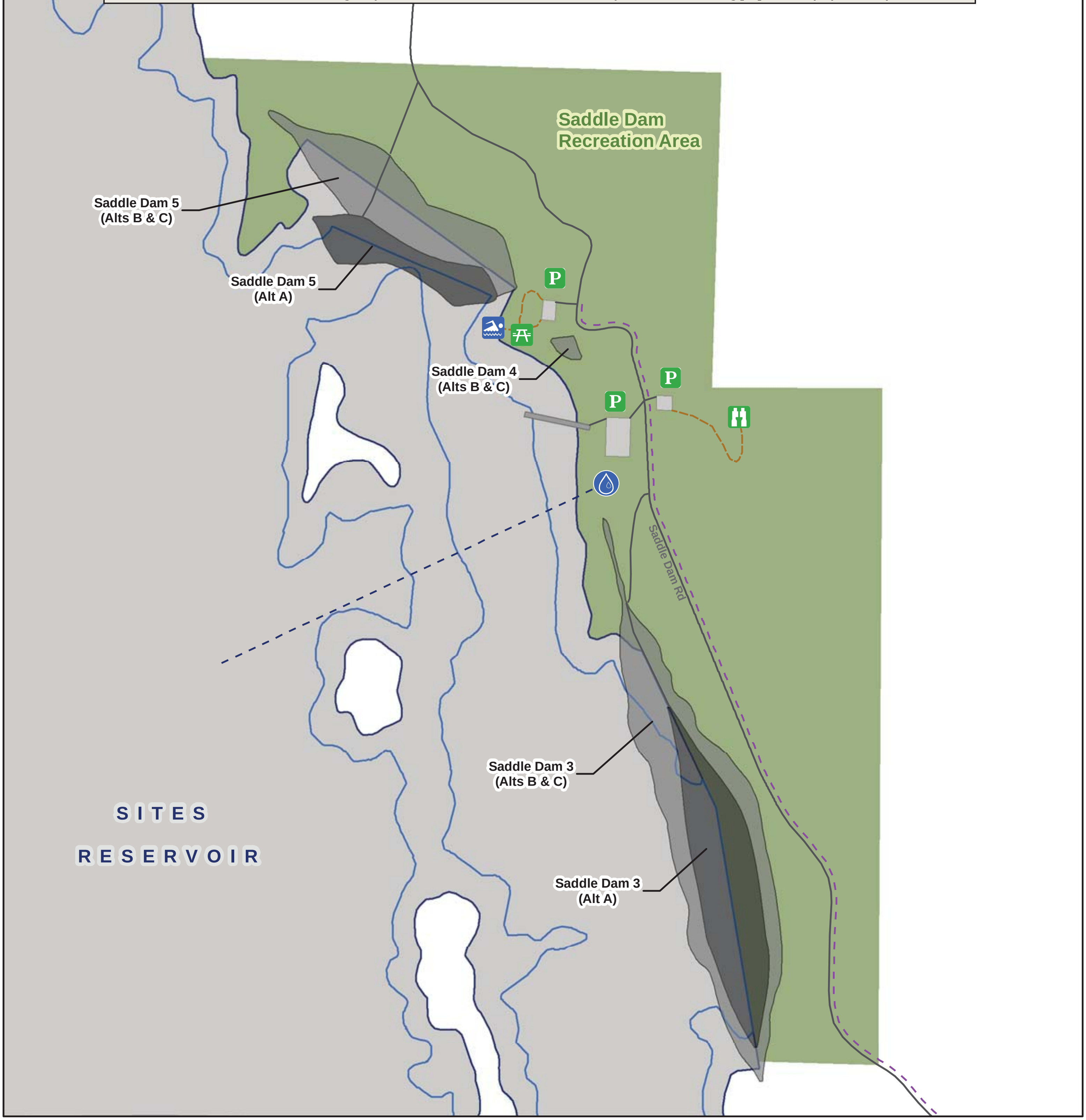

Legend

- Picnic Area
- Swim Beach
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- Delevan Transmission Line
- South Bridge New Roads (gravel)
- Access Roads
- Dam - Alt A
- Dam - Alts B & C
- Recreation Area Parking
- Boat Ramps
- Recreation Area
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir

MAF = Million acre-feet
Alt = Alternative

FIGURE 3-2B
Proposed Saddle Dam Recreation Area and Facilities

North-of-the-Delta Offstream Storage Project

0 250 500 1,000 1,500 2,000 Feet

N

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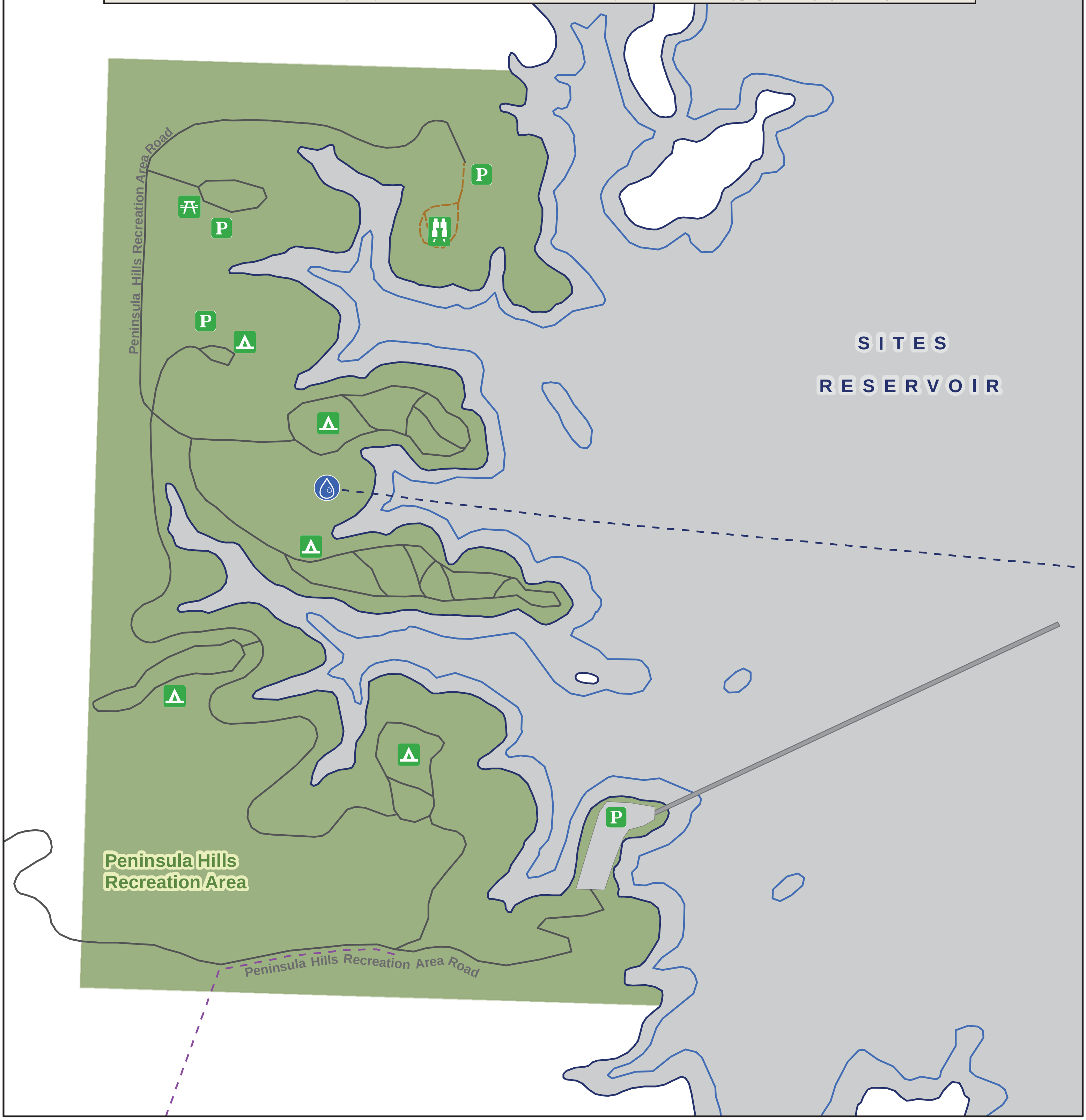

Legend

- Camping/ Group Campsite
- Picnic Area
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- South Bridge New Roads (gravel)
- Access Roads
- Delevan Transmission Line
- Recreation Area Parking
- Boat Ramps
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Area

MAF = Million acre-feet

0 250 500 1,000 1,500 2,000 Feet

FIGURE 3-2C
Proposed Peninsula Hills Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

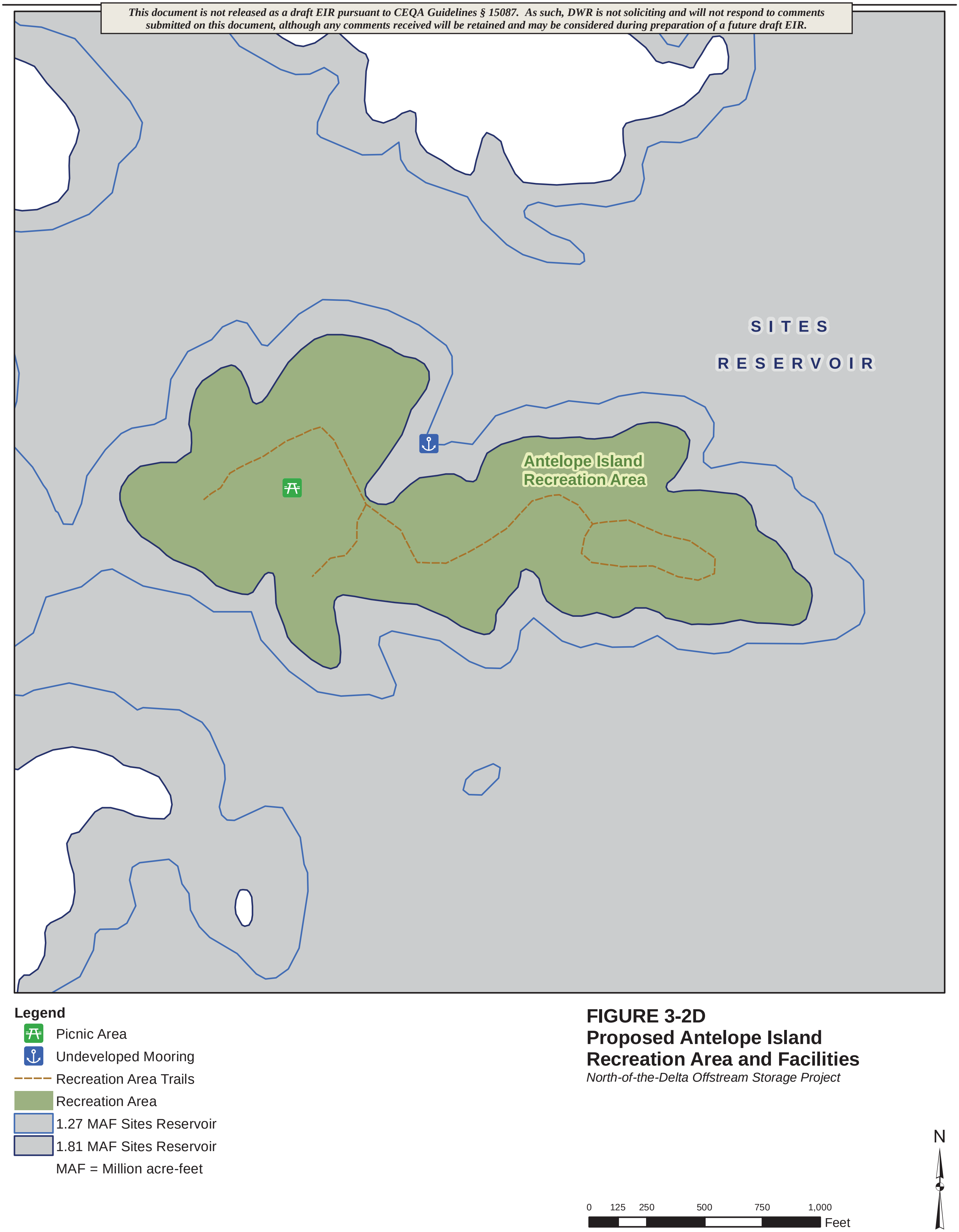

FIGURE 3-2D
Proposed Antelope Island Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

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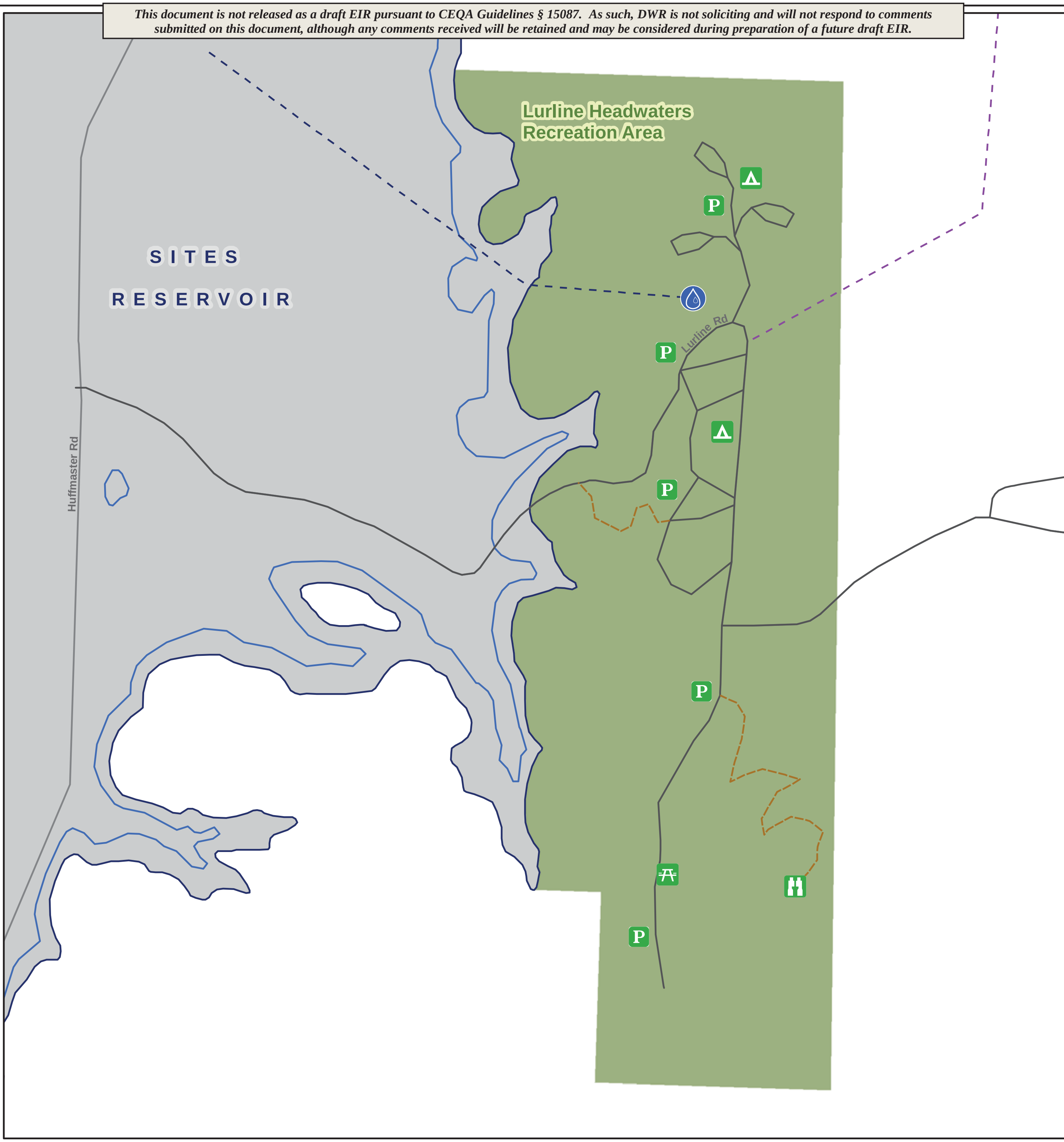

Legend

- Camping/ Group Campsite
- Picnic Area
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- Delevan Transmission Line
- South Bridge New Roads (gravel)
- Access Roads
- Recreation Area Parking
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Area

MAF = Million acre-feet

FIGURE 3-2E
Proposed Lurline Headwaters Recreation Area and Facilities

North-of-the-Delta Offstream Storage Project

N

0 250 500 1,000 1,500 2,000 Feet

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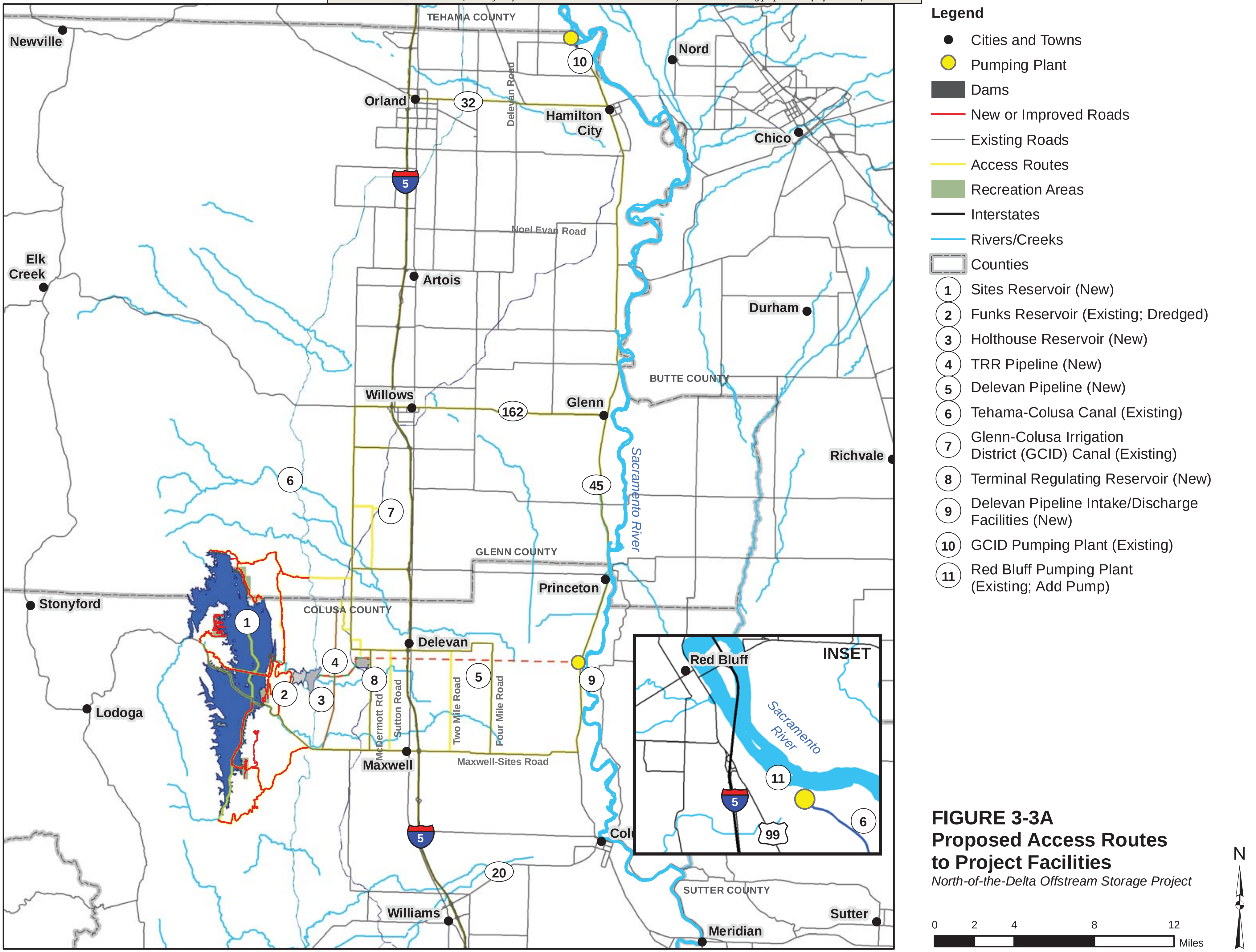

FIGURE 3-3A
Proposed Access Routes to Project Facilities
North-of-the-Delta Offstream Storage Project

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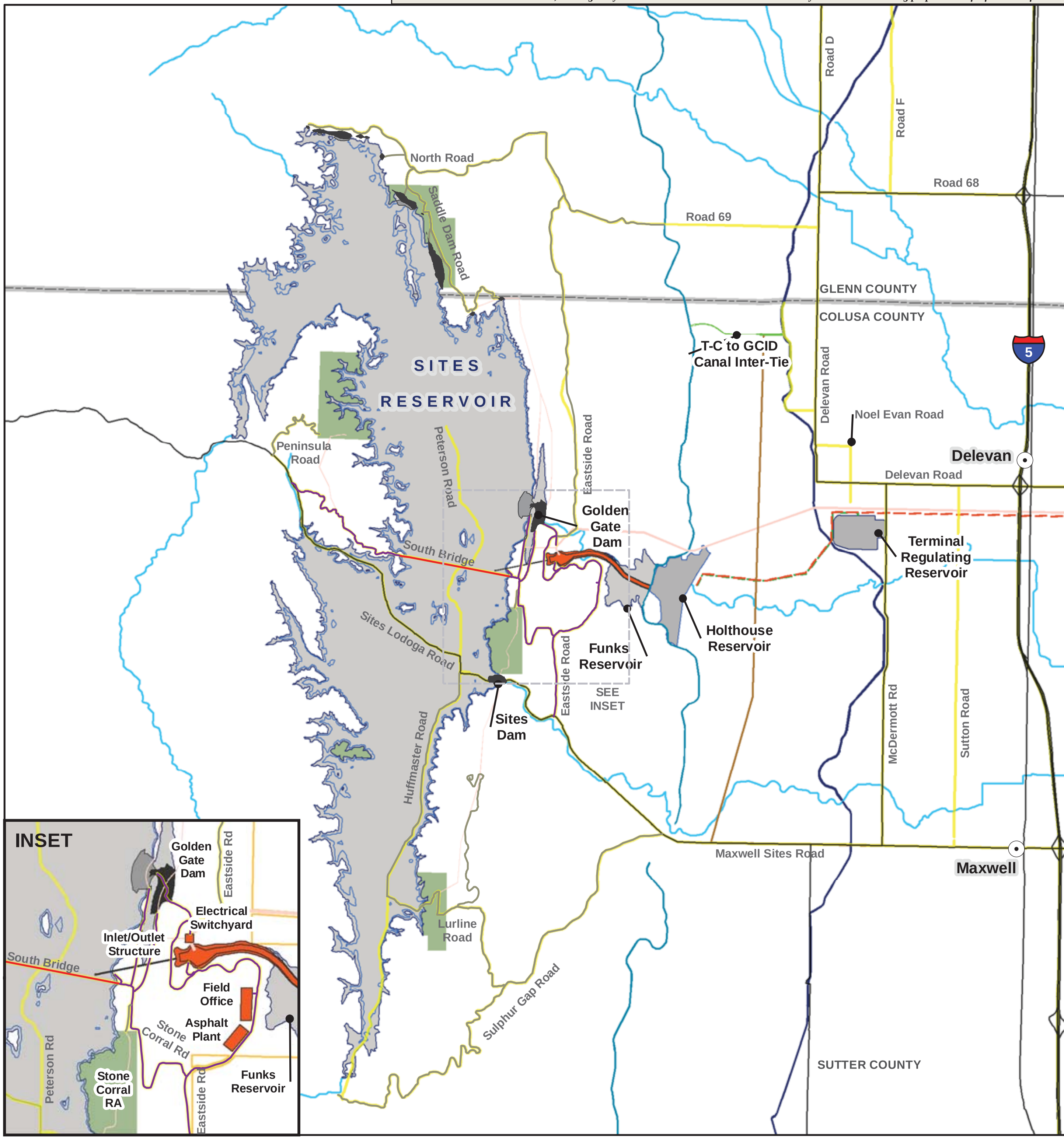

Legend

- 1.27-MAF Sites Reservoir
- 1.81-MAF Sites Reservoir
- Dams (1.27 MAF)
- Dams (1.81 MAF)
- Tehama-Colusa Canal
- Glenn-Colusa Irrigation District Canal
- Recreation Areas
- Transmission Line Easement
- County Line
- Cities
- Creeks
- Delevan Pipeline
- TRR Pipeline
- Existing Roads
- Interstates
- Access Routes

New or Improved Roads

- Gravel
- Paved
- Paved Bridge

FIGURE 3-3B
Proposed Access Routes to Project Facilities
North-of-the-Delta Offstream Storage Project

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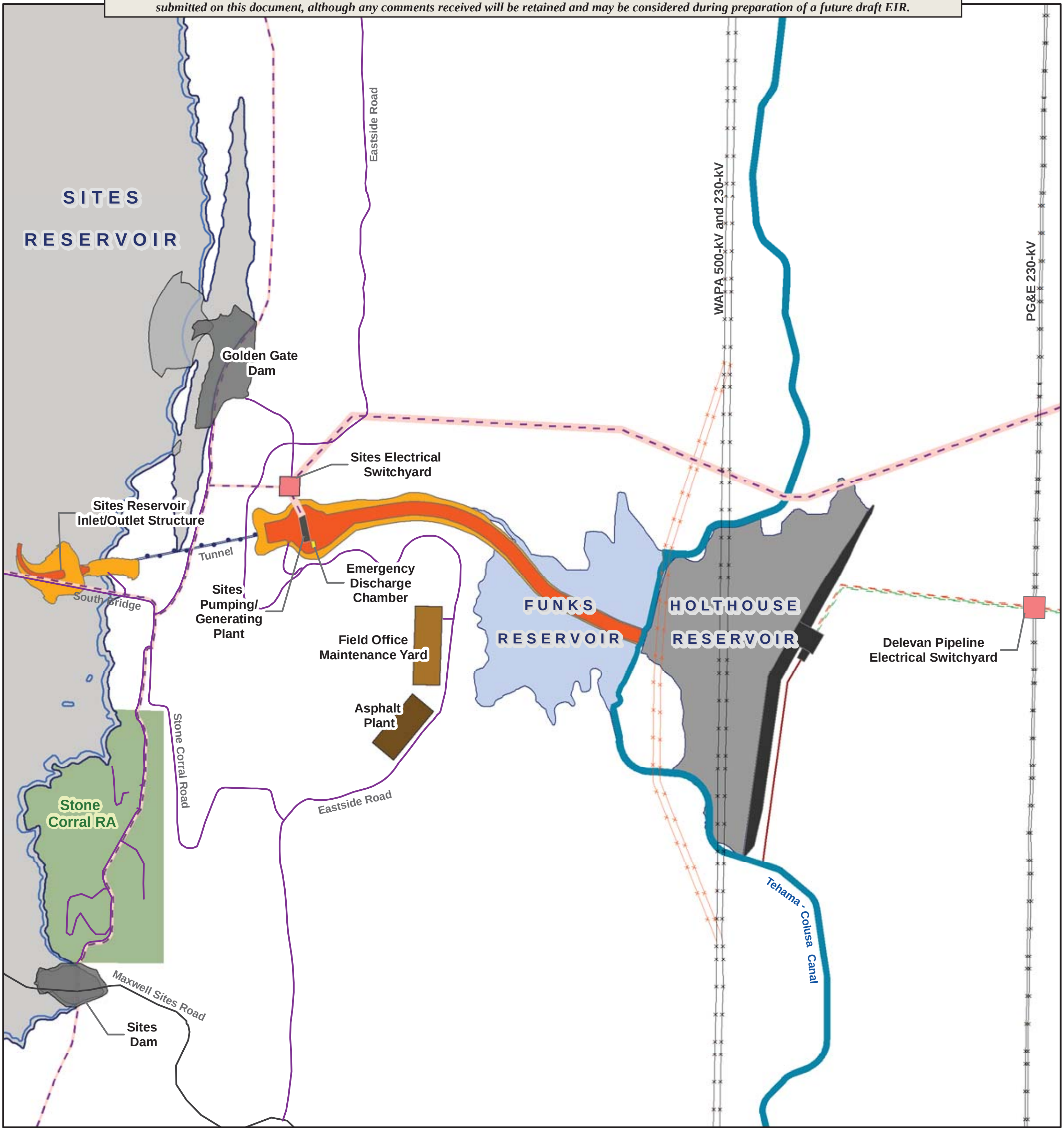


WAPA = Western Area Power Administration; PG&E = Pacific Gas and Electric

Legend

- Sites Reservoir (1.27-MAF)
- Sites Reservoir (1.81-MAF)
- Sites Dams (1.27-MAF)
- Sites Dams (1.81-MAF)
- Holthouse Dam Facilities
- Asphalt Plant
- Field Office Maintenance Yard
- Transmission Line Easement

Sites Reservoir Inlet/Outlet Structure

- Emergency Discharge Chamber
- Inlet/Outlet Concrete Structure
- Inlet/Outlet Excavation Footprint
- Pumping Generating Plant
- Tunnel
- Electrical Switchyard

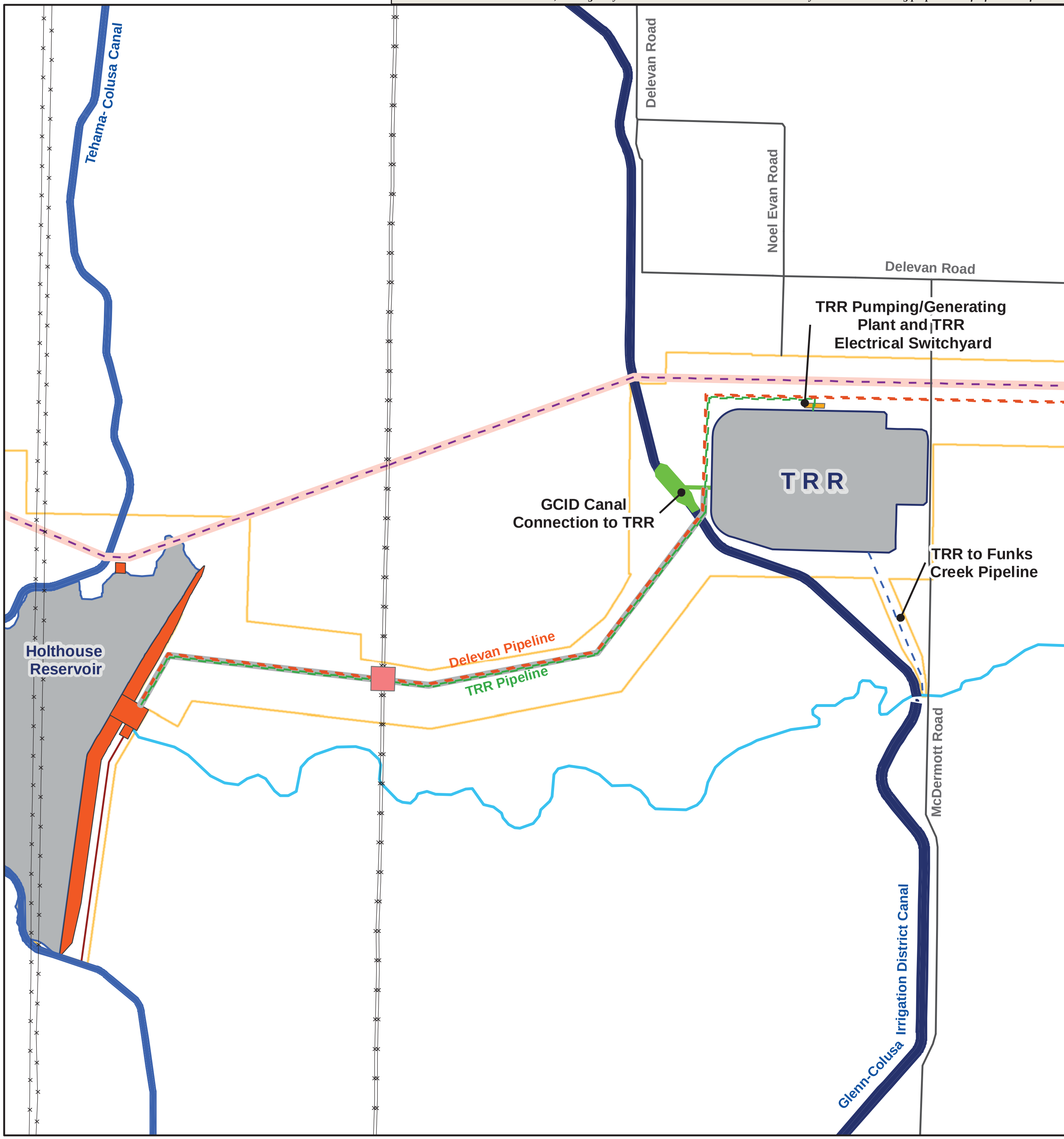
- Existing Powerline
- WAPA Powerline Adjustment
- Proposed Project Roads
- Existing Access Roads
- Delevan Transmission Line
- Delevan Pipeline
- TRR Pipeline

FIGURE 3-4
Proposed Sites Reservoir Inlet/Outlet Structure, Holthouse Reservoir, and Associated Facilities

North-of-the-Delta Offstream Storage Project

0 750 1,500 3,000 4,500 Feet

N



Legend

- Existing Access Roads
- Existing PG&E Transmission Line
- Funks Creek
- TRR Pipeline Road
- Delevan Transmission Line
- Delevan Pipeline
- TRR Pipeline
- TRR to Funks Creek Pipeline
- Delevan Pipeline Electrical Switchyard
- Transmission Line Easement
- Terminal Regulating Reservoir (TRR)
- Glenn-Colusa Irrigation District (GCID) Canal
- GCID Canal Connection to TRR
- TRR Pumping/Generating Plant
- Tehama-Colusa Canal
- Holthouse Dam Facilities
- Holthouse Reservoir
- Construction Disturbance Area

FIGURE 3-5
Proposed Terminal Regulating Reservoir and Associated Facilities
North-of-the-Delta Offstream Storage Project

0 750 1,500 3,000 4,500 Feet

N

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FIGURE 3-6
Location of the Proposed Pump Installation at Red Bluff Pumping Plant
North-of-the Delta Offstream Storage Project

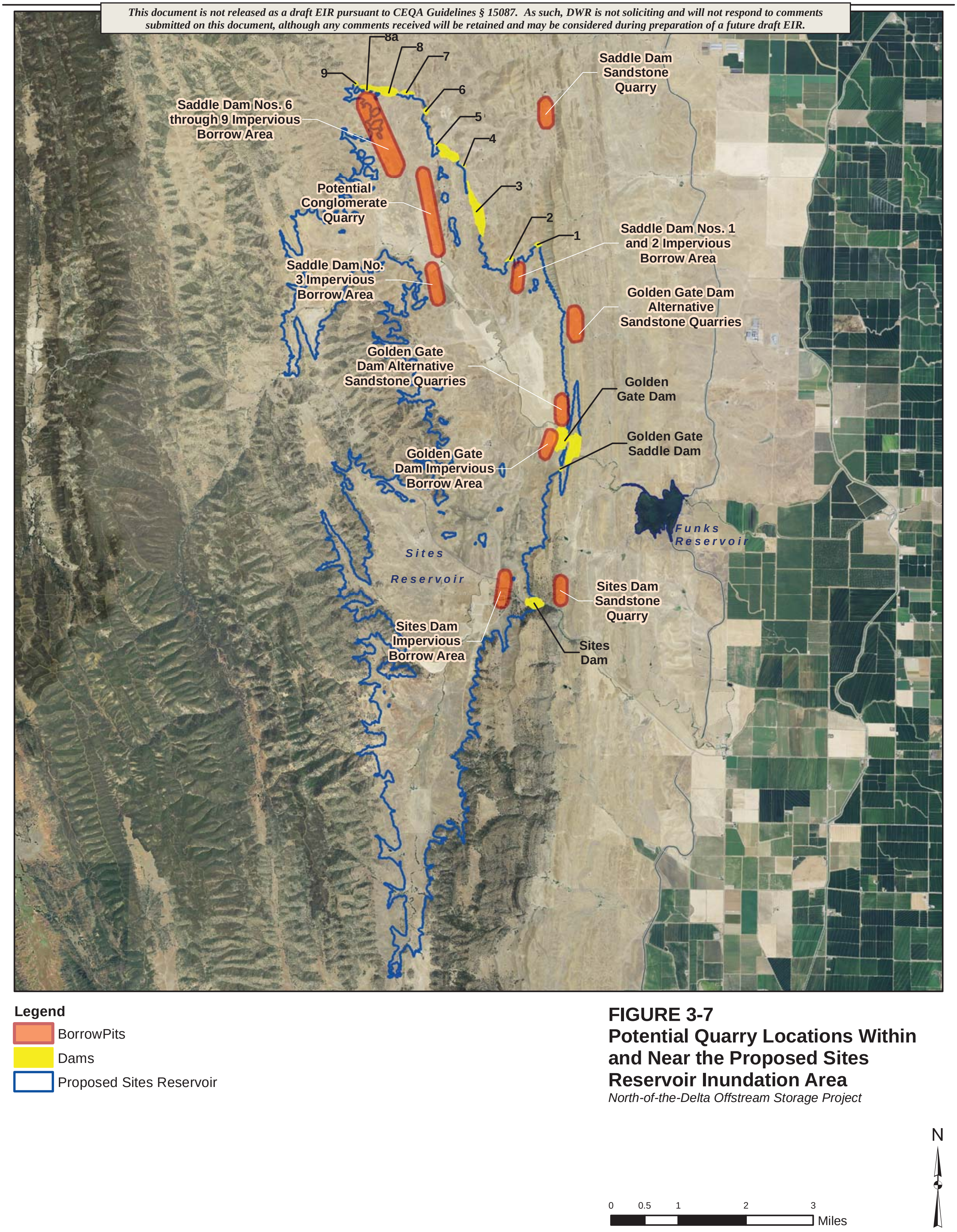


FIGURE 3-7
Potential Quarry Locations Within and Near the Proposed Sites Reservoir Inundation Area
North-of-the-Delta Offstream Storage Project

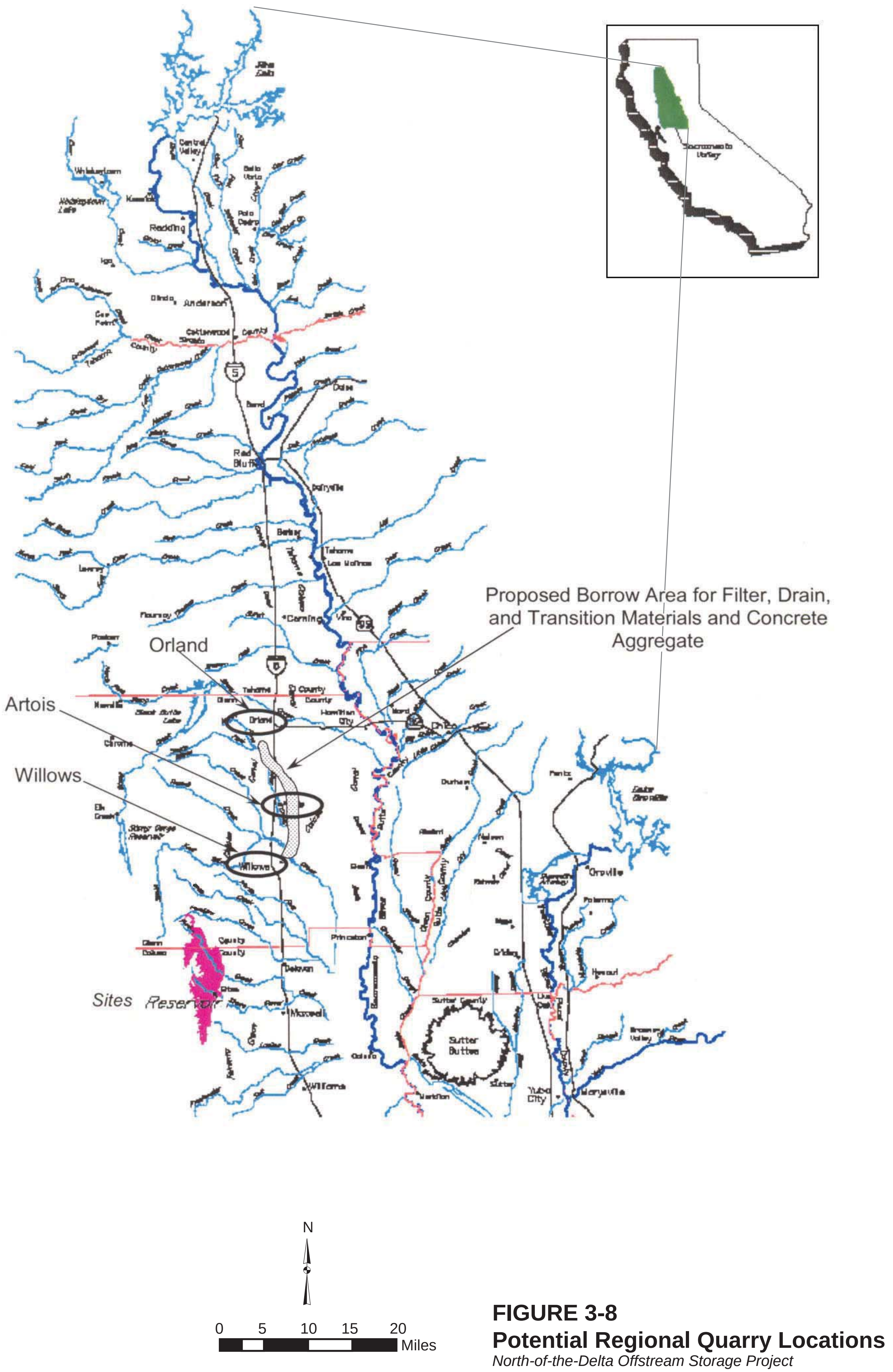
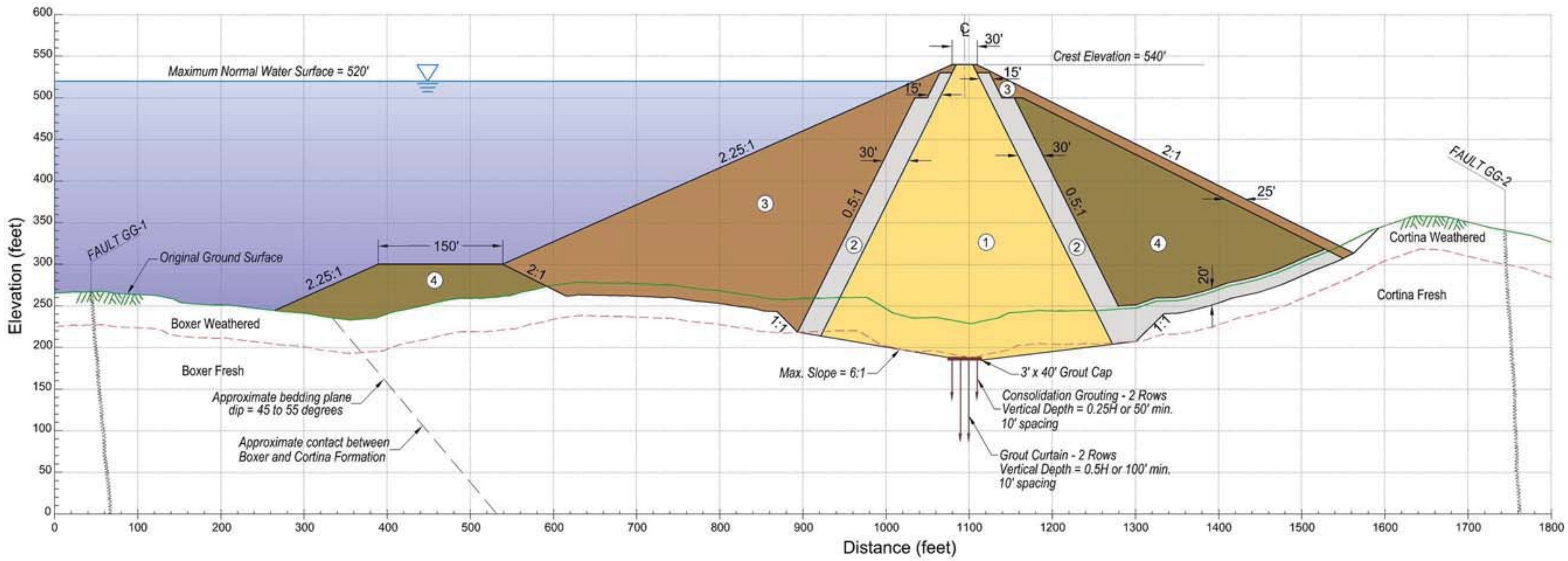


FIGURE 3-8
Potential Regional Quarry Locations
North-of-the-Delta Offstream Storage Project



NOTES

1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.

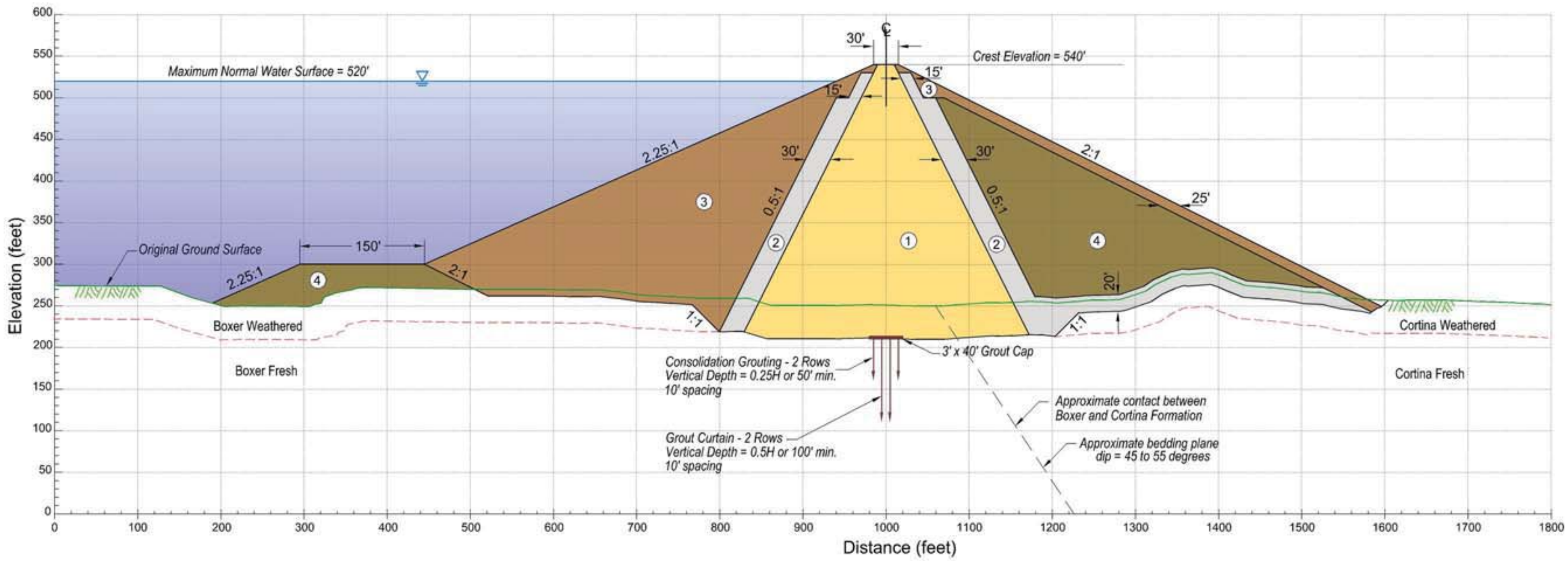
2. Embankment zones are as follows:
   ZONE ① Core
   ZONE ② Upstream and Downstream Filter, Drain, and Transition
   ZONE ③ Rockfill and Riprap - Shell material
   ZONE ④ Random - Shell material

3. H = Height of Dam

4. ℄: Centerline

5. GG: Informal name of fault

FIGURE 3-9
Golden Gate Dam Cross Section Showing Grouting
North-of-the-Delta Offstream Storage Project



NOTES

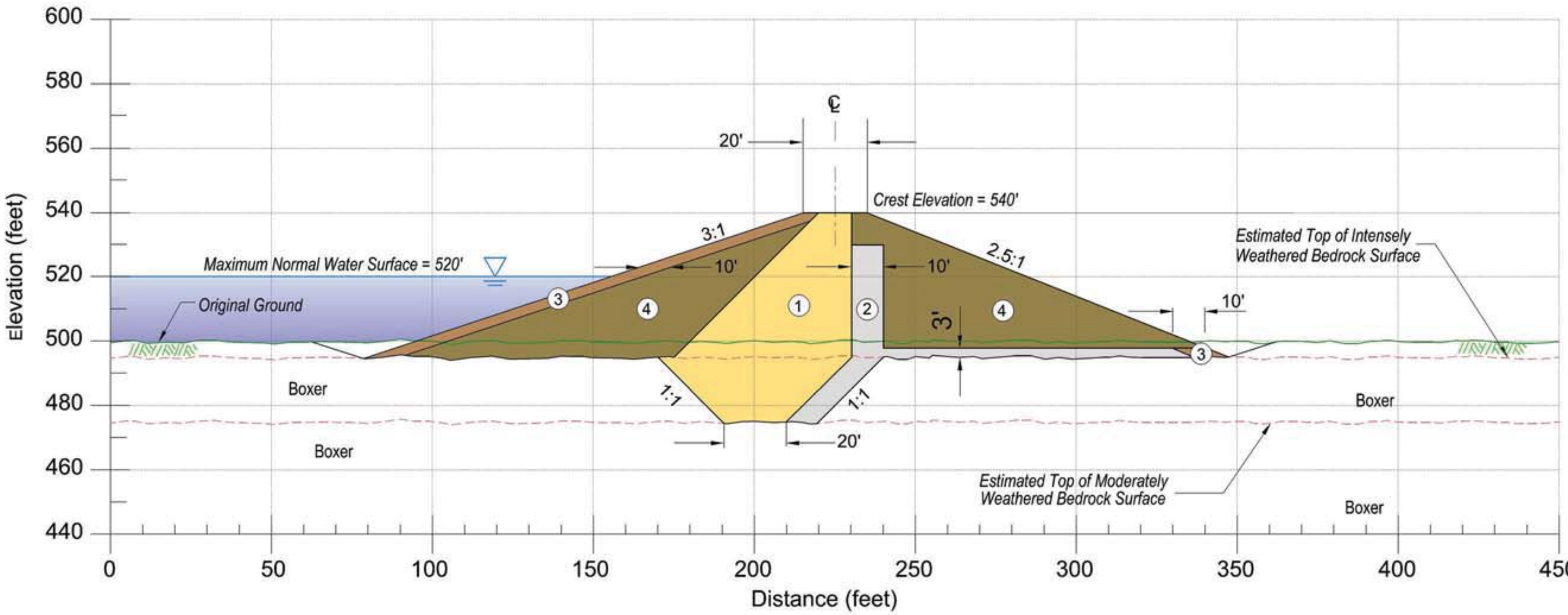
1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.

2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material

3. H = Height of Dam

4. ℄: Centerline

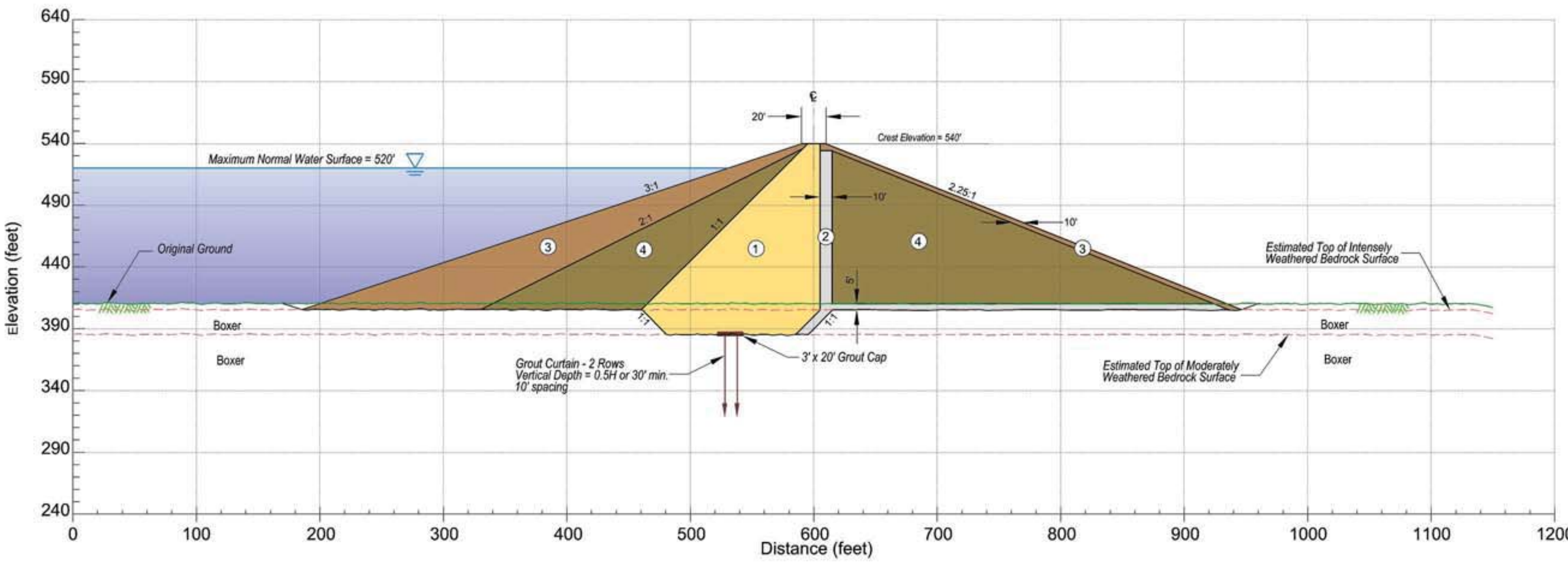
FIGURE 3-10
Sites Dam Cross Section Showing Grouting
North-of-the-Delta Offstream Storage Project



NOTES

1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.
2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material
3. H = Height of Dam
4. ℄: Centerline

FIGURE 3-11
Saddle Dams 1, 2, 4, and 9 Cross Sections Showing Grouting (Typical)
North-of-the-Delta Offstream Storage Project



NOTES

1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.

2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material

3. H = Height of Dam

4. ℄: Centerline

FIGURE 3-12
Saddle Dams 3, 5, 6, 7, and 8 Cross Sections Showing Grouting (Typical)
North-of-the-Delta Offstream Storage Project

Legend

- River Miles
- Delevan Pipeline
- Delevan Transmission Line
- Sacramento River Reaches
- Transmission Line Easement
- Construction Disturbance Area
- Discharge Facility - Alternative B
- Intake Facilities - Alternatives A & C

FIGURE 3-13A
Delevan Pipeline Intake/ Discharge Facilities
North-of-the-Delta Offstream Storage Project

0 500 1,000 2,000 3,000 Feet

N

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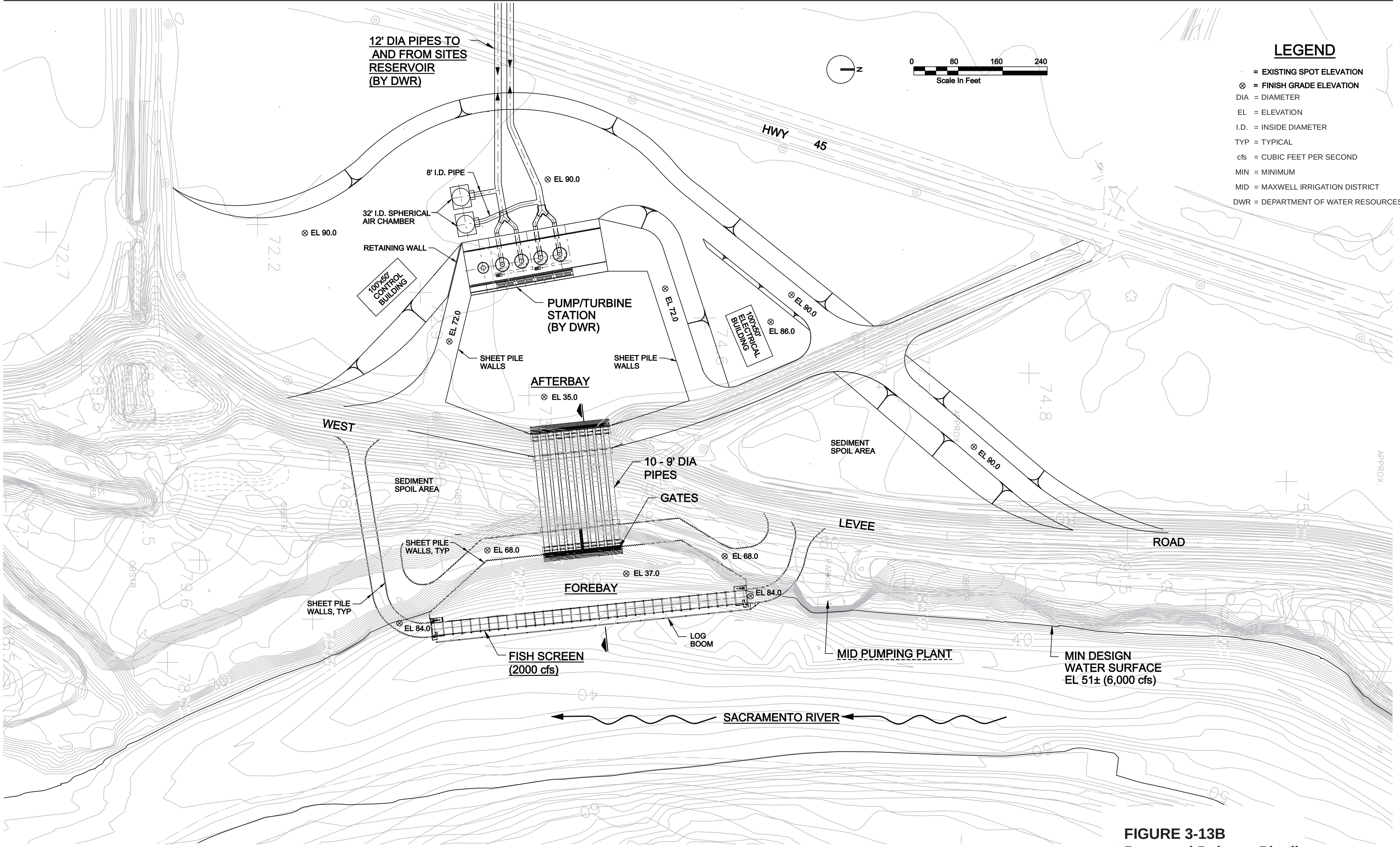
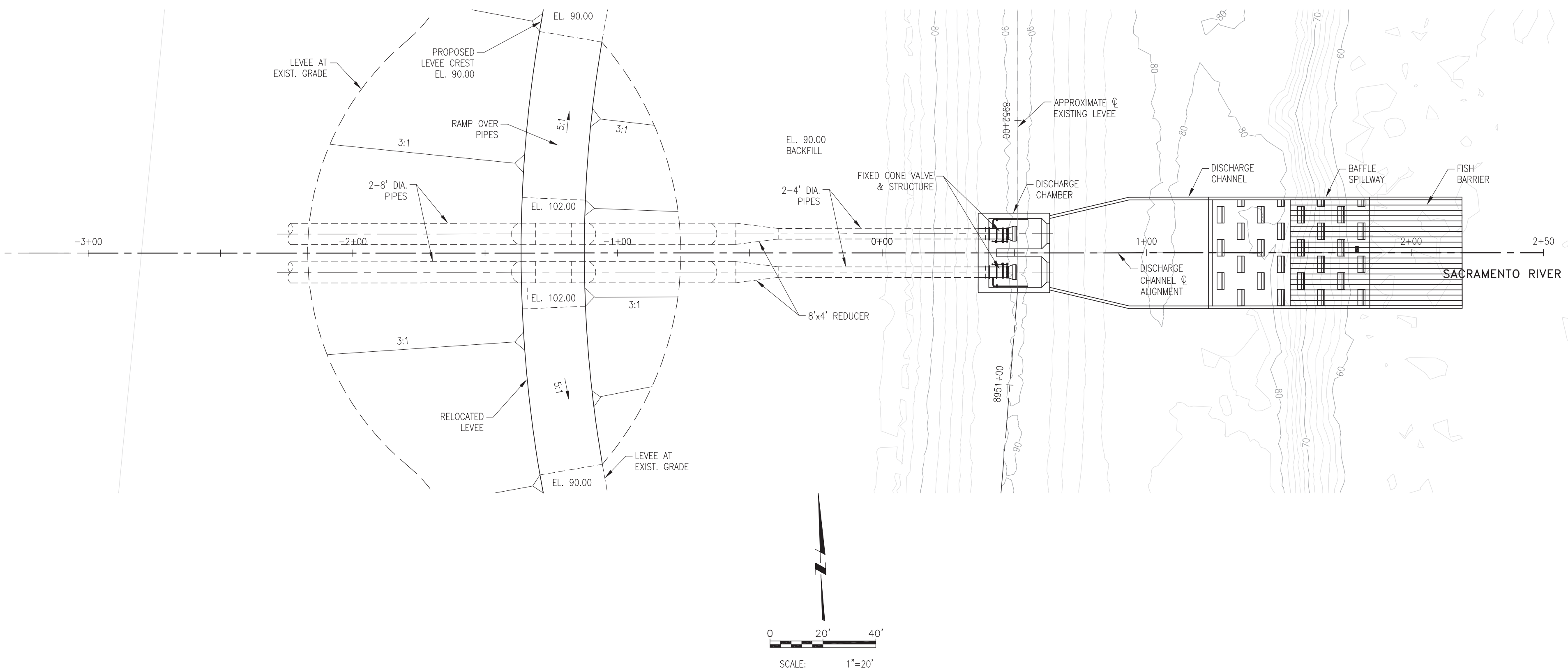


FIGURE 3-13B
Proposed Delevan Pipeline Intake Facilities
North-of-the-Delta Offstream Storage Project

WBG020812033556SAC



LEGEND

DIA = DIAMETER
EL = ELEVATION
℄ = CENTERLINE

Source: URS, 02/18/2011.

FIGURE 3-13C
Proposed Delevan Pipeline Discharge Facility
North-of-the-Delta Offstream Storage Project

WBG020812033556SAC

4. Environmental Compliance and Permit Summary

This chapter includes information about policies and regulations that are applicable to the proposed Project and relevant to the environmental impacts evaluated within the resource chapters. It includes identified regulatory requirements that could be applied to the proposed Project. The first section contains federal, State, and regional laws that are applicable to more than one environmental resource evaluated in this DEIR/EIS, followed by sections that are specific to each of the resource chapters (i.e., Chapters 6 through 31).

4.1 General

4.1.1 Federal Plans, Policies, and Regulations

4.1.1.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA), which was signed into law on January 1, 1970, establishes a national environmental policy and goals for the protection, maintenance, and enhancement of the environment, and provides a process for implementing these goals by the federal agencies.

NEPA requires that all federal agencies use all practicable means to create and maintain conditions under which humans and nature can exist in harmony. NEPA further requires that federal agencies incorporate environmental considerations into their planning and decision making using an interdisciplinary approach.

NEPA's implementing regulations are administered by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR[1]] 1500 et seq.). Section 1502.14 of the CEQ Regulations for Implementing NEPA requires that EISs rigorously explore and objectively evaluate all reasonable alternatives to the project, including the No Action Alternative and reasonable alternatives not within the jurisdiction of the lead agency.

4.1.2 State Plans, Policies, and Regulations

4.1.2.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) statute was passed in 1970 shortly after the passage of NEPA. CEQA institutes a statewide policy of environmental protection which requires State and local agencies to analyze and disclose environmental impacts of all projects and to mitigate impacts to the extent feasible.

CEQA Guidelines §15126.6 requires that EIRs describe and evaluate a reasonable range of alternatives to a project, or to the location of a project, which would feasibly attain most of the basic project objectives and avoid or substantially lessen significant project impacts. CEQA also requires that the No Project Alternative be analyzed.

4.1.3 Local Plans, Policies, and Regulations

According to California Government Code §65300, every county and city in the State of California is required by law to adopt a general plan for the "physical development of the county or city, and any land

[1] The Code of Federal Regulations annual edition is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation.

outside its boundaries which bears relation to its planning". Called the "constitution for future development" by the California Supreme Court, the General Plan is a guideline for growth and policy decisions. The General Plan is intended to serve as a comprehensive long-term document establishing land use and development policy for the next 10 to 20 years.

4.1.3.1 Glenn County General Plan

The most recent General Plan for Glenn County was adopted in 1993 and provides a template for development in the unincorporated areas of the county, outside of the communities of Willows and Orland. The Plan addresses land use, transportation, housing, open space, conservation, safety, noise and economic development.

4.1.3.2 Colusa County General Plan

Colusa County recently adopted a new General Plan, replacing the previous 1989 General Plan. The 2012 Plan provides a framework for decisions on growth, development, and conservation of open space, consistent with the desires of the County's residents and businesses. The Plan contains specific elements including agriculture, transportation, community character, conservation, economic development, housing, land use noise, open space, public services and facilities, and safety. The Plan also includes a Sites Planning Area.

4.2 Chapter 6: Surface Water Resources

4.2.1 Federal Plans, Policies, and Regulations

4.2.1.1 Federal Regulations Related to CVP Authorization and Operations

In the early 1900s, the federal government and the State of California initiated several projects that coordinated water supply, flood control, and navigation benefits. One of the first California projects was proposed in 1920 by Colonel Marshall of the U.S. Geological Survey (USGS) (The Marshall Plan) to construct Shasta and Friant dams and associated facilities to provide water supplies and reduce groundwater overdraft in the San Joaquin Valley. In 1933, the State Legislature adopted the California Central Valley Project (CVP) Act to sell revenue bonds for the facilities. However, because of economic conditions, the bonds could not be sold, and federal government assistance was requested. The Federal Rivers and Harbors Act of 1935 appropriated funds and authorized the U.S. Army Corps of Engineers (USACE) to construct Shasta and Friant dams, power generating and transmission facilities, and the Contra Costa, Madera, and Friant-Kern canals. In 1937, Congress reauthorized the Rivers and Harbors Act, which included a provision to assign construction and operation of the CVP to the Reclamation Service (later known as the Bureau of Reclamation [Reclamation]). This resulted in the CVP being subject to Reclamation Law as defined in the Reclamation Act of 1902 (requiring water users to repay construction costs from which they received benefits) and all supplemental and amendatory acts thereof. Under Reclamation Law, the Secretary of the Interior administers the laws governing the distribution of benefits associated with construction, operation, and maintenance of federal reclamation facilities that provide water for irrigation farmland and other enumerated purposes.

Several other laws were adopted that provided reauthorization or further definition of authorizations for CVP facilities, operations, water service contracting, and environmental protections. One of the most recent laws, the Central Valley Project Improvement Act (CVPIA), substantially amended the CVP authorizations. CVP operations were also substantially modified through adoption of the Coordinated

Operating Agreement, CALFED Bay-Delta Authorization Act, implementation of the Trinity Record of Decision, and the San Joaquin River Agreement (SJRA).

Central Valley Project Improvement Act

The Reclamation Projects Authorization and Adjustment Act of 1992 includes Title 34: the CVPIA. The CVPIA amended the authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes of the CVP having equal priority with irrigation and domestic uses of CVP water, and elevates fish and wildlife enhancement to a level having equal purpose with power generation. Section 3406(b)(2) of the CVPIA provides the basis for implementing upstream and Sacramento-San Joaquin Delta (Delta) actions for fish management purposes. Section 3406(b)(2) includes curtailing exports at Jones Pumping Plant for fishery management protection based on USFWS recommendations.

Among the changes mandated by the CVPIA are:

- Dedicating 800,000 acre-feet[2] annually to fish, wildlife, and habitat restoration – §3406(b)(2)
- Authorizing water transfers outside the CVP service area – §3405
- Implementing an anadromous fish restoration program – §3406(b)(1)
- Creating a restoration fund financed by water and power users – §3407
- Providing for the Shasta Dam temperature control device – §3406(b)(6)
- Implementing fish passage measures at the Red Bluff Diversion Dam – §3406(b)(10)
- Calling for planning to increase the CVP yield – §3406(j)
- Mandating firm water supplies for Central Valley wildlife refuges and wildlife habitat areas – §3406(d)
- Improving the Tracy Fish Collection Facility (a Reclamation facility that researches ways to improve fish protection around water diversion areas) – §3406(b)(4)
- Meeting federal trust responsibility to protect fishery resources in the Trinity River – §3406(b)(23)

Coordinated Operations Agreement

The CVP and State Water Project (SWP) use a common water supply in the Delta. The associated water rights are conditioned by the State Water Resources Control Board (SWRCB). These rights protect the beneficial uses of water individually and jointly for the SWP and CVP for the protection of beneficial uses[3] in the Sacramento Valley and the Delta Estuary. The Coordinated Operations Agreement (COA), signed in 1986, does the following:

- Defines the CVP and SWP facilities and their water supplies
- Sets forth procedures for coordination of operations

[2] An acre-foot is the amount of water that would fill a one acre plot of land up to one foot deep; approximately 325,000 gallons.

[3] Beneficial uses define the resources, services, and qualities of aquatic systems that are the goal of the SWRCB to protect and maintain high water quality. The SWRCB is charged with protecting all these uses from pollution to nuisances that may occur as a result of waste discharges in the region. Beneficial uses of surface waters, groundwater, marshes, and wetlands serve as a basis for establishing water quality objectives and discharge prohibitions.

- Identifies formulas for sharing joint responsibilities for meeting Delta standards as the standards existed in SWRCB D-1485 and other legal uses of water
- Identifies how unstored flow will be shared
- Sets up a framework for exchange of water and services between the SWP and CVP
- Provides for periodic review of the agreement.

In-basin uses, or legal uses of water in the Sacramento Basin, as defined by the COA, include water required under SWRCB D-1485 Delta standards for water quality protection for agricultural, municipal and industrial (M&I), and fish and wildlife use. The SWP and CVP are obligated to ensure water is available for these uses, but the degree of obligation depends on several factors and changes throughout the year. Balanced water conditions are defined in the COA as periods when releases from upstream reservoirs, plus unregulated flows, approximately equal the water supply needed to meet Sacramento Valley in-basin uses and exports. Excess water conditions are periods when the described flows exceed Sacramento Valley in-basin uses and exports. During excess water conditions, sufficient water is available to meet all beneficial needs, and the CVP and SWP are not required to supplement the supply with water from reservoir storage. These conditions must also be mutually agreed upon by both Reclamation and the California Department of Water Resources (DWR). Pursuant to Article 6(g) of the COA, Reclamation and DWR have the responsibility (during excess water conditions) to store and export as much water as possible, within physical, legal, and contractual limits. During balanced water conditions, the CVP and SWP share the responsibility in meeting in-basin uses. When water must be withdrawn from reservoir storage to meet in-basin uses, 75 percent of the responsibility is borne by the CVP and 25 percent is borne by the SWP. When unstored water is available for export while balanced water conditions exist, the sum of CVP stored water, SWP stored water, and the unstored water for export is allocated 45 and 55 percent to the SWP and CVP, respectively.

Implementation of the COA principles has evolved since 1986 because of changes in facilities, including the North Bay Aqueduct, as well as new water quality and flow standards established by SWRCB D-1641 and U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions. For example, water temperature controls at Shasta, Lewiston, and Whiskeytown dams have changed the pattern of storage and withdrawals for the purpose of improving temperature control and managing coldwater pool resources. Such constraints have reduced the CVP's capability to respond efficiently to changes in Delta export or outflow requirements. Periodically, temperature requirements have caused the timing of the CVP releases to be substantially mismatched with Delta export capability, resulting in loss of water supply. On occasion, and in accordance with Articles 6(h) and 6(i) of the COA, the SWP has been able to export water released by the CVP for temperature control in the Sacramento River. The installation of the Shasta Dam temperature control device has substantially improved Reclamation's ability to match reservoir temperature releases and Delta needs.

Other examples of requirements not included in the COA are the objectives in the 1995 Water Quality Control Plan (WQCP), Vernalis Adaptive Management Program (VAMP), and SWRCB in D-1641. The 1986 COA water supply sharing formula is now used to meet D-1641 Delta outflow and salinity-based standards. SWRCB D-1641 also contains "export limitation" criteria such as the export to inflow ratios, and San Joaquin River pulse period "export limits."

The 1986 COA affirmed the SWP's commitment to provide replacement export capacity for restrictions to CVP operations in May and June under SWRCB D-1485. The SWP provided export capacity (up to

195,000 acre-feet) at Banks Pumping Plant and eliminated the potential water delivery loss that would have been incurred by the CVP pursuant to the 1986 COA.

2009 National Marine Fisheries Service Biological Opinion

The 2009 National Marine Fisheries Service (NMFS) Biological Opinion (BO) concluded that the effects of the proposed operations are likely to jeopardize the continued existence of the following:

- Sacramento River winter-run Chinook salmon
- Central Valley spring-run Chinook salmon
- Central Valley steelhead
- Southern DPS of North American green sturgeon
- Southern Resident killer whale

The BO stated that the CVP and SWP have "both directly altered the hydrodynamics of the Sacramento-San Joaquin river basins and have interacted with other activities affecting the Delta to create an altered environment that adversely influences salmon and green sturgeon population dynamics. The altered environment includes changes in habitat formation, species composition, and water quality, among others".

NMFS developed Reasonable and Prudent Alternatives (RPAs) in accordance with federal Endangered Species Act (FESA) requirements. NMFS indicated that, based on the analyses presented in the BO, the "RPA cannot and does not include all steps that would be necessary to achieve recovery." Consequently, NMFS included focused actions designed to compensate for a particular stressor.

The RPAs to the proposed action are summarized below.

- A new year-round temperature monitoring program and reservoir storage management program for Shasta Reservoir to minimize effects to endangered winter-run Chinook salmon that spawn only in the Sacramento River.
- Long-term passage prescriptions at Shasta Dam and re-introduction of winter-run Chinook salmon to its native habitat in the McCloud River and/or upper Sacramento River.
- Maintenance of present flow and water temperature conditions in Clear Creek.
- Modified Red Bluff Diversion Dam (RBDD) gate operations while an alternative diversion structure is being built
- Short-term and long-term actions for improving juvenile rearing habitat in the lower Sacramento River and northern Delta
- Additional Delta Cross Channel gate closures to keep young fish out of artificial channels in the Delta and allow them to migrate safely towards the ocean
- New reverse flow levels in Old and Middle rivers to limit the strength of reverse flows and reduce entrainment at the CVP and SWP facilities
- Use of additional technological measures at the CVP and SWP facilities to enhance screening and increase fish survival

- Additional measures to improve survival of San Joaquin steelhead smolts, including increased San Joaquin River flows and export curtailments, and a new study of acoustic tagged fish in the San Joaquin River Basin to evaluate and refine these measures
- A new American River flow management standard, temperature management plan, additional technological fixes to temperature control structures, and, in the long-term, restoration of steelhead passage at Nimbus and Folsom dams
- A year-round minimum flow regime on the Stanislaus River necessary to minimize project effects to each life stage of steelhead, including new springtime flows that will support rearing habitat formation and inundation, and create pulses that allow salmon to migrate out successfully
- Development of Hatchery Genetic Management Plans to increase the diversity, and therefore, resiliency of salmon to withstand a wide range of conditions

The RPA actions that directly affect water supply operations are summarized below.

- **Clear Creek:** Modify releases from Whiskeytown Dam into Clear Creek to meet daily water temperature requirements and to provide periodic pulse flows for channel maintenance.
- **Upper Sacramento River and releases from Shasta Lake:** Manage reservoir storage volumes in Shasta Lake at the end of September to improve the potential for adequate water for coldwater pool maintenance in order to meet daily water temperature requirements in the fall and to provide adequate carryover storage to meet water temperature requirements in the following year. The RPA also included minimum instream flow targets and recommendations for modifications of water temperature requirements in drier water years that could be used for guidance to maintain adequate coldwater pool volumes.
- **Upper Sacramento River and Red Bluff Diversion Dam:** The RPA supported the current construction of the new diversion structure to eliminate use of the gates that block Sacramento River flows. The RPA also includes requirements for diversions until the new structure is completed.
- **Upper Sacramento River Flows at Wilkins Slough:** Instream flows historically were maintained at Wilkins Slough to provide adequate flows for navigation and more recently to provide adequate elevations for installed pumps. The RPA recommends modifications to this flow criterion.
- **American River:** The RPA supports the flows currently being discussed by Reclamation and other agencies for lower American River flow and water temperature management.
- **Stanislaus River:** The RPA requires modifications in operations of New Melones Reservoir to provide daily water temperature management and minimum instream flows in Stanislaus River.
- **Delta-Cross Channel (DCC) Gate Operations:** The RPA modifies the operations of the DCC Gate that diverts water from the Sacramento River toward the Clifton Court Forebay and the Jones Pumping Plant. The RPA modifies operations of the gate based on salinity in the southern Delta and presence of salmonids[4] in the Sacramento River near Knights Landing and the City of Sacramento. This could result in a reduction of exports.

[4]Salmonids- the family of fish that includes salmon

- **San Joaquin River:** Modification of the export to inflow ratio to reduce exports if the San Joaquin River flows at Vernalis are not adequate to meet the ratio criteria to protect water quality and reduce entrainment of juveniles.
- **Old and Middle River:** The RPA requires reductions in exports to reduce reverse flows when salmonids are present to protect water quality and reduce fish entrainment.

Bay-Delta Water Quality Control Plan

The Bay Delta Water Quality Control Plan outlines water quality objectives for the Delta.

CALFED Bay-Delta Authorization Act

The CALFED Bay-Delta Authorization Act authorized $395 million for a balanced program to increase California's water supply, reliability and quality and help restore sensitive water ecosystems.

The CALFED law was designed to ensure that California will be able to meet its water needs in a balanced manner – for farmers, for cities, and for the environment. Specifically, the law:

- Restores environmentally significant areas of the State, including the San Francisco Bay-Delta: Comprising more than 600 program elements including water purchases to improve river habitat, removal of dams that are no longer necessary and hinder fish migration, restoration of streams, and restoration of significant land habitat.
- Provides necessary water infrastructure to enable California to continue to lead the nation in economic growth and agriculture production: Including screens to protect fish, levee improvements to protect water quality and ensure beneficial land use, through-Delta conveyance importance, and additional ground and off-stream surface water storage.
- Ensures a safe, reliable source of drinking water for California's growing population, including smarter use of water supplies and facilities to reduce environmental impact of water exports

This approach balances the needs of agricultural, urban and environmental interests and helps to address the needs of the State's aging water infrastructure.

CALFED Bay-Delta Implementation Act

In the August 28, 2000 CALFED Record of Decision (ROD), Reclamation and other State and federal agencies committed to implementing a long-term plan to restore the Bay-Delta. This plan consists of many activities including storage, conveyance, ecosystem restoration, levee integrity, watersheds, water supply reliability, water use efficiency, water quality, water transfers, and science. The Implementation MOU, also signed August 28, 2000, continued the operations decision-making process that had evolved through the CALFED process. The ROD identified numerous programs to provide protection to fish in the Bay-Delta Estuary through environmentally beneficial changes in CVP and SWP pumping operations at no uncompensated water cost to CVP and SWP water users.

Trinity River Mainstem Fishery Restoration

In 1994, USFWS, as the NEPA lead agency, and Trinity County, as the CEQA lead agency, began the public process for developing the Trinity River Mainstem Fishery Restoration EIS/EIR. In December 2000, the Secretary of Interior signed the ROD for a variable annual flow regime, mechanical channel rehabilitation, sediment management, watershed restoration, and adaptive management. Based on the

ROD, 368,600 acre-feet to 815,000 acre-feet (depending on water year[5] type) is allocated annually for Trinity River flows. The amount of water released is scheduled in coordination with USFWS to best meet habitat, temperature, and sediment transport objectives in the Trinity River basin.

San Joaquin River Agreement and the Vernalis Adaptive Management Plan

The 1998 San Joaquin River Agreement (SJRA) was adopted through the SWRCB D-1641 agreement. It includes a 12-year experimental program providing for flows and Delta exports in the lower San Joaquin River. This study is conducted during a 31-day pulse flow period occurring April to May. The SJRA also provides for the collection of experimental data during that time to further the understanding of the effects of flows, exports, and a barrier at the head of Old River on salmon smolt survival. This experimental program is commonly referred to as the VAMP. The SJRA also provides water for flows at other times on the Stanislaus, Merced, and lower San Joaquin rivers. SJRA established a management and technical committee to oversee, plan, and coordinate implementation of activities required under the agreement. Reclamation, DWR, USFWS, California Department of Fish and Game (CDFG), and NMFS are signatories to the agreement; other signatories include San Joaquin River water rights holders, SWP and CVP water users, and other stakeholders.

The SJRA (1987) also provides for the collection of experimental data on the effects of flows, exports, and a barrier at the head of Old River. A barrier would deter salmon smolts (juvenile salmon) from entering Old River and direct them to the San Joaquin River where it has been shown that they have an increased survival rate. This experimental portion of the SJRA program is commonly referred to as the Vernalis Adaptive Management Program (VAMP). SWRCB indicates that VAMP experimental data will be used to create permanent objectives for the pulse flow period. The parties to the SJRA include several agencies that contribute flow to the San Joaquin River, divert from or store water on the tributaries to the San Joaquin River, or have an element of control over the flows in the lower San Joaquin River. These include Reclamation, Oakdale Irrigation District, South San Joaquin Irrigation District, Modesto Irrigation District, Turlock Irrigation District, Merced Irrigation District, and the San Joaquin River Exchange Contractors. VAMP is based on coordination among these participating agencies in carrying out their operations to meet an annual target flow objective at Vernalis.

The VAMP program has two distinct components: flow objectives and export restrictions. Flow increases could be provided using CVPIA §3406(b)(1), (b)(2), and (b)(3), which would contribute to fishery needs on the Stanislaus River. The export reduction involves a combined State and federal pumping limitation on the Delta pumps. Pumping reductions that cannot be recovered by adjustments in CVP operations are considered to be §3406(b)(2) water (e.g., it is reserved for fish and wildlife). Reductions of SWP pumping are limited to the amount that can be recovered through operations adjustments and the export of up to 48,000 acre-feet of transferred water to be made available from the Lower Yuba River Accord[6].

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[5] The 12-month period starting October 1st and ending September 30th of the following year in which the surface-water supply is quantified. The water year is defined by the year in which it ends (i.e., October 1, 1998 through September 30, 1999 is the 1999 water year).

[6] The Lower Yuba River Accord provides higher minimum instream flows on the lower Yuba River, funds fisheries studies and restoration activities, enhances water supply reliability in Yuba County, and establishes long-term acquisition of water for the EWA. The "Interim Instream Flows and Fishery Studies in the Stanislaus River Below New Melones Reservoir" (1987 Agreement) specifies interim releases from the New Melones Dam to maintain instream flows as well.

4.2.1.2 Federal Water Quality Regulations Related to Water Supplies

Federal water quality regulations affect SWP and CVP water supplies indirectly through limitations on diversions to protect water quality needs of other beneficial uses.

Clean Water Act

The Federal Water Pollution Control Act was initially adopted in 1948. Modifications to a portion of the act in 1972, 1977, and 2002 became known as the Clean Water Act (CWA, 33 U.S.C. 1251 to 1376). The CWA establishes the basis for regulating discharges of pollutants into surface waters of the United States and regulating water quality standards for stated beneficial uses. Section 303 of the CWA requires states to adopt water quality standards for all surface waters of the United States. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question; and (2) criteria that protect the designated uses. Section 304(a) requires the U.S. Environmental Protection Agency (USEPA) to publish advisory water quality criteria that accurately reflect the latest scientific knowledge on the kind and extent of all effects on health and welfare that may be expected from the presence of pollutants in water. Where multiple uses exist, water quality standards must protect the most sensitive use.

The CWA is implemented by the USEPA. The USEPA is generally directly responsible for implementing CWA provisions, although the CWA also authorizes states to implement portions of CWA through a delegation process. California has this authority to identify beneficial uses and water quality criteria to protect those beneficial uses. SWRCB water rights decisions and orders have been issued to protect beneficial uses during operation of SWP and CVP facilities.

Several provisions of the CWA are implemented through other agencies, including Section 404 of the CWA that authorizes USACE to regulate discharge of dredging material and fill into “waters of the United States (including wetlands),” and The Safe Drinking Water Act (SDWA) of 1974, and amendments in 1986 and 1996, which directed the USEPA to establish national drinking water standards with maximum contaminant levels for a wide variety of constituents and provisions for a mandatory monitoring program for local water suppliers. The 1996 amendments expanded the focus of the SDWA from primarily treatment to source water protection to reduce contamination in municipal water supplies. Many of the SWP and CVP water users are municipalities that must comply with the SDWA and are concerned about water supply facility operations that may increase the potential for contamination.

4.2.2 State Plans, Policies, and Regulations

4.2.2.1 State Water Resource Control Board Water Rights and Water Quality Protection

California law recognizes several types of surface water rights, including riparian and appropriative rights[7]. A riparian right exists through ownership of land adjacent to a stream or other body of water. The right allows a water user to divert from the natural flow of a stream for use on land within the watershed of the source. Seasonal storage of water is not allowed under a riparian right. If there is insufficient water for the reasonable uses of all the riparian users, flows are shared relative to needs. Generally, riparian water users[8] have first priority to the use of the natural flow in a river. Remaining water is available to

[7] Appropriative rights pertain to the diversion of water for immediate use on non-riparian property (property not including or adjacent to a stream) or for storing the water for later use and requires a permit from the SWRCB

[8] Users who extract water for use on lands that directly border a stream; this use does not require a permit from the SWRCB.

appropriative water rights holders[9]. No permit or license is necessary to divert water under claim of riparian right; however, a record of water use should be filed with SWRCB.

Appropriative water rights are granted by the SWRCB based on the time of water right application. Appropriative water rights granted before 1914 ("pre-1914 appropriative water rights") do not require a permit or license; however, the pre-1914 water use is generally recorded with SWRCB. Post-1914 water rights require a permit or license from SWRCB or its predecessor agencies. All new appropriators must file an application with SWRCB and obtain a permit before diverting water. SWRCB determines whether the water will be put to beneficial use, the quantity and pattern of diversion, location of diversion, necessary conditions to protect the environment, the public trust, and prior water rights. If the water is diverted and applied to beneficial use in accordance with the terms of the permit for a period of years, a license may be issued by SWRCB confirming the extent of the permittee's right. The SWRCB has the authority to prevent waste and unreasonable use, prevent unreasonable method of use, unreasonable diversion of water, and to protect public trust uses of water. The SWRCB granted post-1914 appropriate water rights to Reclamation and DWR for the CVP and SWP, respectively.

Water Rights Protections for County of Origin and Upstream Watersheds

Initiation of the CVP in the 1920s by the State of California raised concerns for availability of water remaining in northern California following construction of storage and export facilities. These issues were discussed again in the 1950s as the SWP was being developed. In 1927, the State legislature adopted the Feigenbaum Act. This allows the State to file for unappropriated water[10] for general water resource development plans to avoid further filings by private parties for unappropriated water. The Feigenbaum Act was amended in 1931 to protect the availability of water for beneficial uses in the counties of origin.

Water Rights Decision 1422/Order 83-3 and Water Rights Decision 1275

Individual water rights for the CVP are granted by the SWRCB for the Sacramento, Trinity, American, San Joaquin, and Stanislaus rivers, and several of their tributaries. Water Rights D-1422 and SWRCB Water Rights Order 83-3 provide the water rights and primary operational criteria for New Melones Reservoir. D-1422 includes requirements for water quality conditions on the San Joaquin River at Vernalis.

Water rights for the SWP were granted in 1967 through Water Rights D-1275. This decision also included water quality criteria in the Delta to be implemented with the CVP and SWP.

4.2.2.2 Water Quality Control Plans for the Sacramento/San Joaquin River Basins, the San Francisco Bay Basin, and Development of the 1978 Delta Plan and Water Rights Decision 1485

In 1975 and 1976, the SWRCB adopted the Sacramento–San Joaquin Delta Basin and San Francisco Bay Basin plans, which included water quality standards. These plans formed the basis for the WQCP for the Delta and Suisun Marsh, which was adopted in 1978. This plan included salinity objectives in the Delta for protection of agricultural uses. In 1978, the SWRCB also adopted Water Rights Decision 1485 (D-1485) to implement portions of the plan through modifications to CVP and SWP operations. The 1978 Delta Plan considered the need to develop methods to improve circulation and change diversion to

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[9] Users who extract water for delivery to a parcel of land that is not adjacent to the stream or other water source. This use requires a permit from the SWRCB.

[10] Unappropriated water is any usable water that is not claimed under prior rights.

protect water quality in the southern Delta. Reclamation and DWR protested many of the requirements of D-1485, including the ability of new water rights applicants to change Delta inflows that would need to be corrected through modification of CVP and SWP operations to continue to meet Delta water quality requirements. Alternatives to D-1485 and the 1978 Delta Plan were developed and discussed through the mid-1990s.

In the 1978 Delta Plan and D-1485, requirements were based on the Sacramento Valley 40-30-30 Index and San Joaquin Valley 60-20-20 Index. The Sacramento Valley 40-30-30 Index is computed through a weighted average of:

- The current water year's April through July unimpaired flow[11] forecast in the Sacramento Valley (weighted as 40 percent)
- The current water year's October through March unimpaired flow forecast in the Sacramento Valley (weighted as 30 percent)
- The previous water year's index (a cap of 10.0 million acre-feet is put on the previous year's index to account for required flood control reservoir releases during wet years weighted as 30 percent).

The Sacramento Valley unimpaired flow is a combination of flows for Sacramento River at Bend Bridge near Red Bluff, Feather River inflow to Lake Oroville, Yuba River flows at Smartville, and American River inflow to Folsom Lake. The criteria for water year classifications under the Sacramento Valley 40-30-30 Index are as follows:

- **Wet Year:** Weighted sum greater than or equal to 9,200,000 acre-feet
- **Above Normal Year:** Weighted sum less than 9,200,000 acre-feet and greater than 7,800,000 acre-feet
- **Below Normal Year:** Weighted sum less than 7,800,000 acre-feet and greater than 6,500,000 acre-feet
- **Dry Year:** Weighted sum less than 6,500,000 acre-feet and greater than 5,400,000 acre-feet
- **Critical Year:** Weighted sum equal to or less than 5,400,000 acre-feet

The San Joaquin Valley 60-20-20 Index is computed through a weighted average using:

- The current water year's April through July unimpaired flow forecast (weighted as 60 percent)
- The current water year's October through March unimpaired flow forecast (weighted as 20 percent)
- The previous water year's index with a maximum amount to reflect flood releases in wetter water years (weighted as 20 percent).

The Sacramento Valley unimpaired flow is a combination of flows for Stanislaus River inflow to New Melones Reservoir, Tuolumne River inflow to Don Pedro Reservoir, Merced River inflow to Exchequer Reservoir (Lake McClure), and San Joaquin River inflow to Millerton Lake.

The criteria for water year classifications under the San Joaquin Valley 60-20-20 Index are as follows:

- **Wet Year:** Weighted sum greater than or equal to 3,800,000 acre-feet
- **Above Normal Year:** Weighted sum less than 3,800,000 acre-feet and greater than 3,100,000 acre-feet
- **Below Normal Year:** Weighted sum less than 3,100,000 acre-feet and greater than 2,500,000 acre-feet

[11] Unimpaired flow is runoff that would have occurred had water flow remained unaltered in rivers and streams instead of stored in reservoirs, imported, exported, or diverted. The unimpaired flow forecast is the estimate of unimpaired flow that will be available for that water year.

- **Dry Year:** Weighted sum less than 2,500,000 acre-feet and greater than 2,100,000 acre-feet
- **Critical Year:** Weighted sum equal to or less than 2,100,000 acre-feet

Development of the 1995 and 2006 Water Quality Control Plans, and Orders 98-09 and 95-9

In 1994, representatives of the federal and State governments, urban and agricultural water users, and environmental interest groups agreed to implementation of the interim Bay-Delta protection plan. The 1995 Bay-Delta WQCP was adopted in 1995 and included provisions for operations of the CVP and SWP to be consistent with requirements of the USFWS 1995 Delta Smelt BO and NMFS 1995 Winter-Run Chinook Salmon BO. Water Rights Order 95-6 was subsequently adopted by SWRCB to eliminate inconsistencies between water rights permit conditions and the WQCP water quality objectives, and was extended through 1999 under Water Rights Order 98-09. Water Rights Order 95-9 also required CVP to release water from New Melones Reservoir to comply with salinity standards in the San Joaquin River at Vernalis. The WQCP and the CVPIA were several of the first plans that required the CVP and SWP to be operated in a manner to protect fish and wildlife as well as agricultural and urban water users. Many of the water quality provisions of these requirements were similar to those in D-1485. However, 1995 WQCP also included additional requirements for managing Delta salinity through X2[12] requirements, upper limits on exports, and operations of the DCC gates to protect fish. The WQCP also included water temperature standards for estuaries that were primarily developed to manage discharge of cooling water from thermal power plants.

The SWRCB undertook a proceeding to amend the 1995 WQCP. The SWRCB adopted a revised Bay-Delta Plan on December 13, 2006. There were no changes to the beneficial uses from the 1995 Plan to the 2006 Plan, nor were any new water quality objectives adopted in the 2006 Plan. A number of changes were made simply for consistency. The SWRCB initiated a Comprehensive Review of the Bay-Delta Plan entitled Water Rights and Other Requirements to Protect Fish and Wildlife Beneficial Uses and the Public Trust, in 2008.

4.2.2.3 State Water Resources Control Board Decision 1641 (D-1641)

With D-1641, adopted on December 29, 1999, the SWRCB implements the objectives of the 1995 Bay Delta WQCP and imposes flow and water quality objectives on the CVP and SWP. D-1641 specifies that, from February through June, the location of X2 must be west of Collinsville and must additionally be west of Chipps Island or Port Chicago for a certain number of days each month, depending on the previous month’s Eight River Index[13]. D-1641 specifies that compliance with the X2 standard may occur in one of three ways: (1) the daily average EC at the compliance point is less than or equal to 2.64 milliohms/cm; (2) the 14-day average EC is less than or equal to 2.64 milliohms/cm; or (3) the three-day average Delta outflow is greater than or equal to the corresponding minimum outflow.

In D-1641, the SWRCB assigned responsibilities to Reclamation and DWR for meeting these requirements on an interim basis. These responsibilities required that the CVP and SWP be operated to meet water quality objectives in the Delta, pending a water rights hearing to allocate the obligation to

[12] X2 is the location of the two parts per thousand salinity contour (isohaline), one meter off the bottom of the estuary, as measured in kilometers upstream from the Golden Gate Bridge.

[13] The Eight River Index refers to the sum of the unimpaired runoff for the following locations: Sacramento River flow at Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River flow at Smartville; American River, total inflow to Folsom Reservoir; Stanislaus River, total inflow to New Melones Reservoir; Tuolumne River, total inflow to Don Pedro Reservoir; Merced River, total inflow to Exchequer Reservoir; and San Joaquin River, total inflow to Millerton Lake.

meet the water quality and flow-dependent objectives among all users of the Sacramento and San Joaquin river basins with appropriative water rights with post-1914 priority dates. However, in lieu of this hearing, the SJRA and Sacramento Valley Water Management Agreement are settlements between Reclamation and DWR with water users upstream of the Delta, in which the CVP and SWP committed to continue to meet the D-1641 water quality requirements in return for other commitments by major upstream water-rights holders. After these agreements were executed, SWRCB cancelled the water rights hearing to allocate that responsibility.

The SWRCB revised D-1641on March 15, 2000. The requirements in the revised D-1641 address the standards for fish and wildlife protection, urban water quality, agricultural water quality, and Suisun Marsh salinity. D-1641 also authorizes the CVP and SWP to jointly use each other’s points of diversion in the southern Delta (also known as Joint Point of Diversion), with conditional limitations and required coordination plans, and modifies the Vernalis salinity standard in the WQCP.

The Joint Point of Diversion was authorized to meet a prioritized list of conditions. The highest priority was to convey CVP water in SWP facilities to several water service contractors located in the San Joaquin Valley, and to recover export reductions that were required to protect fish. The next priorities were for authorized purposes of current CVP and SWP water rights permits up to the physical capacity of the diversion facilities. The Joint Point of Diversion diversions are allowed only under excess conditions, as previously discussed, and after water rights and BO requirements for the Contra Costa Water District (CCWD) Los Vaqueros Project are met. The second priority also requires operations in accordance with a Fisheries Response Plan.

4.2.2.4 State Water Resources Control Board Regulations

Water quality regulations related to waste discharge and National Pollutant Discharge Elimination System (NPDES) permits are discussed in the Surface Water Quality section of this chapter. The following discussion is related to water quality regulations that affect water supplies of the CVP and SWP.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established surface and groundwater quality regulations that set limits on water quality constituents for the purpose of protecting beneficial uses[14] and provided the authority for the SWRCB to protect the State’s surface and groundwater. The nine Regional Water Quality Control Boards (RWQCBs) were established to oversee and implement specific water quality activities in their geographic jurisdictions.

The Porter-Cologne Act requires the RWQCBs to establish water quality objectives while acknowledging that water quality may change without unreasonably affecting beneficial uses. Therefore, water quality objectives are references as opposed to rules for meeting federal and State requirements for water quality control.

The Porter-Cologne Act also requires that each RWQCB develop basin plans that establish and periodically review the beneficial uses and water quality objectives for surface and groundwater bodies within its jurisdiction. Water quality objectives provide specific water quality guidelines to protect groundwater and surface water to maintain designated beneficial uses. The SWRCB, through its

[14] “Beneficial uses” of the waters of the State that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

RWQCBs, is the permitting authority in California to administer NPDES and waste discharge requirements for regulation of waste discharges in their respective jurisdictions.

The USEPA may allow a state to implement portions of the CWA. In 1972, the State Legislature amended the Porter-Cologne Act to give SWRCB the authority to implement those portions of the CWA. Portions of WQCPs that are consistent with and under the jurisdiction of the CWA also require approval by USEPA.

The Burns-Porter Act

The Burns-Porter Act of 1959, also known as the Water Resources Development Bond Act, authorized the sale of general obligation bonds to finance and develop the initial facilities of the State Water Resources Development System, which are now known as the SWP. The Burns-Porter Act also authorized the State of California to enter into contracts for the sale, delivery, or use of water made available by the State Water Resources Development System.

Delta Protection Act of 1959

The Delta Protection Act (California Water Code §12220) was adopted in 1959. This legislation incorporated by reference the county of origin and water protection acts. It found that maintenance of an adequate water supply in the Delta is necessary for the health, safety, and welfare of the people of the State. An adequate water supply is sufficient to maintain and expand agriculture, industry, urban, and recreational development and provides a common source of freshwater for export to areas of water deficiency (frequently referred to as the “Common Pool”) in the Delta. The legislation also declared that the CVP and SWP would provide salinity control and adequate water supply for users of water in the Delta. The legislation also defined the “Legal Delta” boundaries to include portions of Sacramento, San Joaquin, Yolo, Solano, and Contra Costa counties.

Delta Protection Act of 1992

The Delta Protection Act of 1992 (also known as the Johnston-Baker-Andal-Boatwright Delta Protection Act) established the Delta Protection Commission and defined the Commission’s principal jurisdiction. The Act declared that the Delta is a natural resource of statewide, national, and international significance, containing irreplaceable resources, and that it is the policy of the State to recognize, preserve, and protect those resources of the Delta for the use and enjoyment of current and future generations, in a manner that protects and enhances the unique values of the Delta as an evolving place (PRC §29701 to 2).

Monterey Agreement

In addition to the requirements established by SWRCB and other federal and State agencies, SWP operations are subject to requirements of their contracts. The SWP delivers the portion of available water supplies to each contractor as calculated each year. If excess water is available, Article 21 of the SWP contracts allows for delivery of the excess water (also known as “Article 21 Water”). However, as water supply availability frequently was reduced because of water quality, water rights, and environmental concerns, water deliveries have been reduced to many SWP water users. SWP contractors had raised issues with the allocation of surplus and carryover storage flows. In response to these issues, in 1994, DWR and SWP contractor representatives agreed to a set of 14 principles to modify the long-term SWP water supply contracts in a document that became known as the Monterey Agreement, which included principles to increase water supply reliability, improve financial management, and increase water management flexibility. A program EIR was completed and certified in 1995. Subsequent litigation related to the EIR required DWR to prepare a new EIR. The SWP operates under many of the provisions of the Monterey Agreement, including methods to allocate available water supplies, provisions for water transfers, and transfer of ownership for the Kern Fan Element (groundwater bank) to Kern County Water Agency to provide for more flexibility.

Monterey Plus

The Monterey Plus EIR is officially known as an EIR on the Monterey Amendment to the State Water Projects (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus).

The objective of the Monterey Plus EIR is to resolve the underlying issues that led to the Monterey Amendment and implement the Settlement Agreement. Specific objectives of the Monterey Plus are to:

- Resolve conflicts and disputes among SWP contractors regarding water allocations and financial responsibilities for SWP operations;
- Restructure and clarify procedures for SWP water allocation and delivery during times of shortage and surplus;
- Reduce financial pressures on agricultural contractors in times of drought and supply reductions;
- Adjust the financial rate structure of the SWP to more closely match revenue needs;
- Facilitate water management practices and water transfers that improve reliability and flexibility of SWP water supplies in conjunction with local supplies;
- Resolve legal and institutional issues related to storage of SWP water in Kern County groundwater basins, and in other areas.

The Monterey Agreement provided in Principle 13 that the proposal was an integrated package. Contractors had to choose to participate in all the provisions of the Monterey Agreement or none. In other words, the Monterey Amendment resulted from a package deal of negotiated concessions that required achieving all of the above objectives in order to settle significant disputes among the contractors. Specific objectives of the Settlement Agreement are to:

- Communicate SWP supply reliability information to SWP contractors and local planning jurisdictions and clarify related SWP contract language;
- Enhance public review of SWP contract amendments and public participation in environmental review;
- Provide assurances regarding finality of certain Table A transfer and transfer of title to the Kern Fan Element land and assurances regarding environmental protection of Kern Fan Element lands;
- Increase SWP watershed enhancement activities in Plumas County and improve Plumas County's access to SWP water; and
- Provide funding to plaintiffs to implement the Settlement Agreement including watershed restoration projects.

Although the Settlement Agreement does not have the same language that the Monterey Agreement had with regard to an integrated package, the Settlement Agreement also was a package deal of negotiated concessions that required achieving all of the above objectives in order to settle significant disputes between the parties.

Suisun Marsh Protection Act and Plan (1974)

In 1974, the California Legislature passed the Nejedly-Bagley-Z'berg Suisun Marsh Protection Act (SMPA) of 1974, designed to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the San Francisco Bay Conservation and Development Commission (BCDC) and CDFG to prepare a protection plan for Suisun Marsh "to preserve the integrity and assure continued wildlife use" of the marsh. The objectives of the protection plan are to preserve and enhance the quality and diversity of the Suisun Marsh's aquatic and wildlife habitats, and to ensure retention of upland areas adjacent to the marsh in uses compatible with its protection.

Suisun Marsh Preservation Agreement (1987)

Since the early 1970s, the California Legislature, SWRCB, Reclamation, CDFG, Suisun Resource Conservation District (SRCD), DWR, and other agencies have worked to preserve beneficial uses of Suisun Marsh as mitigation for potential impacts of reduced Delta outflow on Delta salinity. On March 2, 1987, the SMPA (1987) was signed by DWR, Reclamation, CDFG, and SRCD, CVP, and SWP.

The purpose of the SMPA (1987) was to establish mitigation for impacts on salinity from the SWP, CVP, and other upstream diversions. The SMPA (1987) has the following objectives:

- To ensure that Reclamation and DWR maintain a water supply of adequate quantity and quality for managed wetlands within Suisun Marsh to mitigate adverse effects on these wetlands from CVP and SWP operations, as well as a portion of the adverse effects of other upstream diversions.
- To improve Suisun Marsh wildlife habitat on these managed wetlands.
- To define the obligations of Reclamation and DWR necessary to ensure the water supply, distribution, management facilities, and actions necessary to accomplish these objectives.
- To recognize that water users in Suisun Marsh (i.e., existing landowners) divert water for wildlife habitat management within the Suisun Marsh.
- Set a timeline for implementing the Suisun Marsh Protection Plan[15]
- Delineate monitoring and mitigation requirements
- Include provisions to recognize water uses in Suisun Marsh and improve wildlife habitat within the marsh

On June 20, 2005, a revised SMPA (1987) was signed to make channel water salinity requirements consistent with the SWRCB's Decision 1641 and replace additional large-scale water management facilities with landowner water and management activities to meet the SMPA (1987) objectives in the western portion of Suisun Marsh.

The two primary mechanisms for meeting salinity standards include the implementation and operation of facilities in the marsh and management of Delta outflow. The facilities include the Suisun Marsh Salinity

[15] The Suisun Marsh Protection Plan was prepared by the San Francisco Bay Conservation and Development Commission and CDFG in 1976. The Plan's objectives are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection.

Control Gates (SMSCGs) on Montezuma Slough (initiated in 1988) to restrict high salinity flows from Grizzly Bay into Montezuma Slough during incoming tides and to retain low salinity water, and the RRDS and Morrow Island Distribution System (constructed in 1979 and 1980) to provide low salinity water to a portion of the Suisun Marsh wetlands.

California Water Plan

Chapter 1 of Volume 2, Resource Management Strategies to the California Water Plan (CWP) – Update 2009, includes surface storage as a resource management strategy toward the management objective of helping to meet water-related resource management needs through an increase in water supply. Chapter 12 of Volume 2 includes the NODOS Project as a surface storage alternative identified in the CALFED ROD and recommends continued work efforts to complete environmental studies for the NODOS Project.

4.3 Chapter 7: Surface Water Quality

4.3.1 Federal Plans, Policies, and Regulations

4.3.1.1 Clean Water Act Section 303(d) Total Maximum Daily Load

Section 303(d) of the CWA establishes requirements for states to identify and prioritize water bodies that do not meet water quality standards and are not supporting their designated beneficial uses. As defined by the CWA, water quality standards consist of two elements: (1) designated beneficial uses of the water body in question; and (2) criteria that protect the designated uses. For these water quality–limited water bodies, states must calculate the total maximum daily load[16] (TMDL) for the contaminants of concern, set an allowable load to achieve water quality standards, and adopt a plan of implementation within the applicable water quality management plan. Placement on this list triggers development of a TMDL Program for each water body and associated pollutant/stressor on the list.

These waters are placed on the §303(d) List of Impaired Waters. This list defines low, medium, and high priority pollutants that require immediate attention by federal and State agencies. The RWQCBs are responsible for implementing the TMDL program in California. Completed or ongoing TMDLs in the Bay-Delta region include chlorpyrifos and diazinon, dissolved oxygen, mercury/methylmercury, pathogens, pesticides, organochlorine pesticides, salt and boron, and selenium.

4.3.1.2 Clean Water Act Section 402 NPDES Permit Compliance

The NPDES permit system pursuant to §402 of the CWA applies to discharges of wastes to surface waters of the U.S. Under California's Porter-Cologne Act, the SWRCB and associated RWQCBs regulate discharges of wastes to all waters of the State and land to protect both surface and groundwater.

In November 1990, the California Environmental Protection Agency (CalEPA) established regulations that provided stormwater permit requirements for specific categories of industries, including construction (Phase I Rule). Under Phase I, a stormwater permit was required for construction projects that disturbed five acres of land, and for large Municipal Separate Storm Sewer Systems (MS4s). In December 1999, the USEPA issued regulations (Phase II Rule) that expanded the NPDES program to require a stormwater discharge permit for construction activities with a disturbance area of one to five acres and for small MS4s. In California, the CalEPA has delegated responsibility for CWA implementation to the SWRCB.

[16] TMDL is the maximum amount of a specified pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant.

4.3.1.3 Clean Water Act Section 404

Pursuant to CWA Section 404, a program was established to regulate the discharge of dredged and fill material into waters of the U.S., including some wetlands. Activities in waters of the U.S. that are regulated pursuant to this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry. Waters of the U.S. include navigable waters[17] of the U.S.; interstate waters; waters where their use, degradation, or destruction could affect interstate or foreign commerce; tributaries to any of these waters; and wetlands that meet any of these criteria or are adjacent to any of these waters or their tributaries. Wetlands are defined pursuant to §404 as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three wetland delineation criteria: (1) hydrophytic vegetation (i.e., plants that grow in saturated soil), (2) hydric soil types (i.e., soils that are wet or moist enough to develop anaerobic conditions[18]), and (3) wetland hydrology.

Pursuant to §404(b)(1) of the CWA, the Least Environmentally Damaging Practicable Alternative (LEDPA) must be identified from among those alternatives considered in detail in an EIS/EIR. If a federal agency is a partner in the implementation of a project, then the Proposed Action/Project must be recognized as the LEDPA. A Section 404(b)(1) evaluation must be included with a project's Final EIS/EIR pursuant to the CWA, to provide required information on the potential effects of project activities regarding water quality and to provide rationale in support of identifying the LEDPA.

4.3.1.4 Rivers and Harbors Act Section 10

Section 10 of the Rivers and Harbors Act requires authorization from USACE for the construction of any structure in or over navigable waters of the U.S., the excavation/dredging or deposition of material in these waters, or any obstruction or alteration in navigable water.

4.3.1.5 Federal Antidegradation Policy

The Federal Antidegradation Policy is designed to provide the level of water quality necessary to protect existing uses and provide protection for higher quality and national water resources. The federal policy directs states to adopt a statewide policy that includes the following primary provisions:

1. Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

2. Where the quality of waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.

[17] Waters subject to the ebb and flow of the tide shoreward to the mean high water mark that may be used to transport interstate or foreign commerce.

[18] Conditions where there is no oxygen present in the soil.

3. Where high quality waters constitute an outstanding national resource, such as waters of national and State parks and wildlife refuges, and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

4.3.1.6 Federal Safe Drinking Water Act

The Federal SDWA was established to protect the public health and quality of drinking water in the United States, whether from aboveground or underground sources. The SDWA directed the USEPA to set national standards for drinking water quality. It required the USEPA to set Maximum Contaminant Levels (MCLs)[19] for a wide variety of potential drinking water pollutants. The owners or operators of public water systems are required to comply with primary (health-related) MCLs and are encouraged to comply with secondary (nuisance- or aesthetics-related) MCLs.

Federal SDWA standards apply to treated water as it is served to consumers. All surface waters require some form of treatment in order to meet drinking water standards. The degree of treatment needed depends on the quality of the raw water[20]. The highest quality raw surface waters need only to be disinfected before being served to consumers. More typically, raw water is treated in a conventional water treatment plant that includes sedimentation, filtration, and disinfection processes. Municipal water suppliers prefer raw water sources of high quality because their use minimizes risk to public health and minimizes the cost and complexity of treatment to meet SDWA standards.

Some constituents of Delta water are of particular concern to municipal contractors because they are either not removed, or only partially removed, by community-used water treatment processes. Constituents of concern include total dissolved solids (TDS)[21], chlorides, bromides, and organic compounds. These substances can be removed from raw water by advance water treatment processes, but to do so substantially increases the cost borne by municipalities.

The Department of Public Health (DPH) is designated by the USEPA as the primary agency to administer and enforce requirements of the Federal SDWA in California. Public water systems are required to monitor for regulated contaminants in their drinking water supply. California's drinking water standards (e.g., MCLs) are the same or more stringent than the federal standards and include additional contaminants not regulated by the USEPA.

4.3.1.7 Federal Surface Water Treatment Rule

The Federal Surface Water Treatment Rule is implemented in the State of California by the California Surface Water Treatment Rule, which satisfies three specific requirements of the Federal SDWA by: (1) establishing criteria for determining when filtration is required for surface waters; (2) defining minimum levels of disinfection for surface waters; and (3) addressing *Cryptosporidium* spp., *Giardia lamblia*, *Legionella* spp., *E. coli*, viruses, turbidity, and heterotrophic plate count by setting a treatment technique. A treatment technique is set in lieu of an MCL for a contaminant when it is not technologically or economically feasible to measure that contaminant. The Surface Water Treatment Rule applies to all drinking water supply activities in California, and implementation is overseen by DPH.

[19] The maximum concentration of a pollutant that is allowed in drinking water systems; the level below which there is no known or expected risk to health.

[20] Raw water is untreated water from either a surface or groundwater source.

[21] Total Dissolved Solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water, expressed in units of mg per unit volume of water (mg/L), also referred to as parts per million (ppm).

National Toxics Rule

In 1992, pursuant to the CWA, the USEPA promulgated the National Toxics Rule (NTR) to establish water quality criteria for 14 states and two territories, including California, that had not complied fully with §303(c)(2)(B) of the CWA. As described in the preamble to the final NTR, when a state adopts water quality criteria consistent with the requirements of §303(c)(2)(B) of the CWA, and the USEPA approves, the USEPA will issue a rule amending the NTR to withdraw the federal criteria for that state. If the state's criteria are no less stringent than the promulgated federal criteria, the USEPA will withdraw its criteria and commence rulemaking without notice because additional comment on the criteria is unnecessary. However, if a state adopts criteria that are less stringent than the federally promulgated criteria, but in the USEPA's judgment fully meet the requirements of the CWA, the USEPA will provide an opportunity for public comment before withdrawing the federally promulgated criteria. The result is the California Toxics Rule (CTR) and the §303(d) list of impaired waters.

Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region

The *Long-Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region* is a cooperative effort of USEPA, USACE, the SWRCB, the San Francisco Bay RWQCB, and the San Francisco BCDC to develop a new approach to dredging and disposal of dredged materials in the San Francisco Bay Area. An average of six million cubic yards of sediment must be dredged every year to maintain safe navigation in and around San Francisco Bay, resulting in controversy surrounding appropriate management of such an effort. The following are the major goals of the LTMS:

- Maintain in an economically and environmentally sound manner those channels necessary for navigation in San Francisco Bay and Estuary and eliminate unnecessary dredging activities in the Bay and Estuary.
- Conduct dredged material disposal in the most environmentally sound manner.
- Maximize the use of dredged material as a resource.
- Establish a cooperative permitting framework for dredging and dredged material disposal applications.

The final policy environmental impact statement/programmatic environmental impact report for the LTMS addresses the salt ponds in and around south San Francisco Bay, mainly within the context of their role as habitat for the California least tern, snowy plover, California clapper rail, salt marsh harvest mouse, and California brown pelican. The presence of such species causes restrictions on potential management strategies, but disposal of dredged materials has potential benefits. For example, such disposal may create or restore seasonal wildlife habitats by raising and modifying topography, and thus improving wetland hydrology. Disposal of dredge material in the salt ponds would require a permit from the San Francisco BCDC.

Disinfectant and Disinfection Byproducts Rule

The 1986 amendments to the federal SDWA required USEPA to propose a rule for disinfectants and disinfection byproducts. The rule must balance the need for protection from cancer-causing chemicals (byproducts) with the need for protection from pathogenic microbes (bacteria, viruses, and protozoans) that are killed by disinfection. In 1992, USEPA began a rulemaking process called the "Reg-Neg" process. Negotiators in the process included staff members from State and local health and regulatory agencies, elected officials, consumer groups, environmental groups, and representatives from public water systems. The Reg-Neg process resulted in a two-stage approach for regulation development. The Stage 1 Disinfectant and Disinfection Byproduct Rule (DBP Rule) was promulgated in November 1998. Compounds affected under Stage 1 regulations of the DBP Rule include total trihalomethanes, total haloacetic acids, total organic carbon, bromate, chlorine, chloramines, chlorine dioxide, and chlorite.

The Stage 2 of the DBP Rule was promulgated in 2006. This final rule requires systems that deliver disinfected water to meet maximum contaminant levels as an average at each compliance monitoring location (instead of as a system-wide average as in previous rules) for two groups of DBPs, trihalomethanes and five haloacetic acids. The rule targets systems with the greatest risk and builds incrementally on existing rules. The rule also contains a risk-targeting approach to better identify monitoring sites where customers are exposed to high levels of DBPs.

Comprehensive Environmental Response, Compensation and Liability Act, as Amended

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – or Superfund – provides federal funds to clean up uncontrolled or abandoned hazardous waste sites, accidents, spills, discharges, and other emergency releases of pollutants and contaminants into the environment. Through CERCLA, the USEPA was given power to seek out those parties responsible for any hazardous release, and assure their cooperation in the cleanup.

The Superfund Amendments and Reauthorization Act (SARA) of 1986 reauthorized CERCLA to continue cleanup activities around the country. Several site-specific amendments, definition clarifications, and technical requirements were added to the legislation, including additional enforcement authorities. Title III of SARA authorized the Emergency Planning and Community Right-to-Know Act.

Federal Insecticide, Fungicide, and Rodenticide Act, as Amended

The Federal Insecticide, Fungicide, and Rodenticide Act mandates that the USEPA regulate the sale and use of pesticides to protect human health and to protect the environment. The Act was initially passed in 1972 and has been repeatedly amended. Amendments to the Act strengthen the registration process, enforce compliance against banned or unregister chemicals, and provide a regulatory framework.

Federal Environmental Protection Agency Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion I

Ecoregional nutrient criteria are developed to represent surface waters that are minimally impacted by human activities and thus protect against the adverse effects of nutrient over-enrichment from cultural eutrophication. The USEPA's recommended process for developing such criteria includes physical classification of waterbodies, determination of current reference conditions, evaluation of historical data and other information (such as published literature), use of models to simulate physical and ecological processes or determine empirical relationships among causal and response variables (if necessary), expert judgment, and evaluation of downstream effects. The USEPA has used elements of this process to produce the information contained in this document. The causal (total nitrogen, total phosphorus) and biological and physical response (chlorophyll *a*, turbidity) variables represent a set of starting points for states and tribes to use in establishing their own criteria.

4.3.2 State Plans, Policies, and Regulations

The following State regulations apply to surface water quality, but are discussed in another section of this chapter, as indicated in parentheses:

- Porter-Cologne Water Quality Control Act (Surface Water Resources)
- State Water Resources Control Board Decision 1641 (D-1641) (Surface Water Resources)
- Water Quality Control Plan for the Sacramento/San Joaquin River Basins (Surface Water Resources)
- San Francisco Bay Basin Water Quality Control Plan (Surface Water Resources)

4.3.2.1 California Water Code, Section 13160

California Water Code, Section 13160, authorizes the SWRCB to act as the State water pollution control agency for purposes of compliance with Section 401 of the CWA. For an activity that may result in any discharge into navigable waters, Section 401 of the federal CWA requires a federal license or permit applicant to provide to the licensing or permitting agency a certification from the state in which the discharge originates that any such discharge will comply with State water quality standards and other appropriate requirements. The SWRCB administers the Section 401 program. Section 401 requires the SWRCB to find that there is a reasonable assurance that an activity will be conducted in a manner that will not violate applicable water quality standards and other appropriate requirements. Certification may be conditioned with other limitations to assure compliance with various CWA provisions.

4.3.2.2 State Water Resources Control Board Water Rights Decisions, Water Quality Control Plans, and Water Quality Objectives

The preparation and adoption of WQCPs is required by the California Water Code and supported by the CWA. According to Section 13050 of the California Water Code, WQCPs consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation needed for achieving the objectives. Because beneficial uses, together with their corresponding water quality objectives, can be defined per federal regulations as water quality standards, the WQCPs are regulatory references for meeting the State and federal requirements for water quality control. One substantial difference between the State and federal programs is that California's WQCPs establish standards for groundwater in addition to surface water. Adoption or revision of surface water standards is subject to the approval of the USEPA.

The SWRCB Water Rights Division has primary regulatory authority over water supplies and issues permits for water rights—specifying amounts, conditions, and construction timetables—for diversion and storage facilities. Water rights decisions implement the objectives adopted in water quality control plans and reflect water availability, recognize prior water rights and flows needed to preserve instream uses (such as water quality and fish habitat), and whether the diversion of water is in the public interest.

WQCPs adopted by RWQCBs are primarily implemented through the NPDES permitting system and issuance of waste discharge requirements to regulate waste discharges so that water quality objectives are met. Basin plans provide the technical basis for determining waste discharge requirements and authorize the RWQCBs to take regulatory enforcement actions if deemed necessary.

4.3.2.3 California Antidegradation Policy

The California Antidegradation Policy, formally known as the *Statement of Policy with Respect to Maintaining High Quality Waters in California* (SWRCB Resolution No. 68-16), restricts degradation of surface and ground waters. In particular, this policy protects water bodies where existing quality is higher than necessary for the protection of beneficial uses. Pursuant to the Antidegradation Policy, any actions that can adversely affect water quality in all surface and ground waters must (1) be consistent with maximum benefit to the people of the state, (2) not unreasonably affect present and anticipated beneficial use of the water, and (3) not result in water quality less than that prescribed in water quality plans and policies. Furthermore, any CFR §131.12) developed pursuant to the CWA.

4.3.2.4 Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary

The current WQCP in effect in the Delta is the 2006 WQCP for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary. The WQCP identifies beneficial uses of water in the Delta to be protected, water quality objectives for the reasonable protection of beneficial uses, and an implementation program to achieve the water quality objectives.

The 2006 WQCP adoption did not involve substantial changes to the prior 1995 WQCP. The 1995 WQCP was developed as a result of the December 15, 1994 Bay Delta Accord, which committed the SWP and CVP to new Delta habitat objectives. The new objectives were adopted by amendment through a water rights decision (D1641) for SWP and CVP operations. One key feature of the 1995 WQCP is the estuarine habitat objectives (X2) for Suisun Bay and the western Delta. The X2 standard refers to the position at which 2 ppt salinity occurs in the Delta estuary, and is designed to improve shallow water fish habitat in the spring of each year. The X2 standard requires specific daily or 14-day salinity, or three-day averaged outflow requirements, to be met for a certain number of days each month from February through June.

Other elements of the WQCP include export-to-inflow ratios intended to reduce entrainment of fish at the export pumps, DCC gate closures, minimum Delta outflow requirements, and San Joaquin River salinity and flow standards.

4.3.2.5 San Water Quality Control Plan for the North Coast

The North Coast WQCP was adopted in May 2011 and is a comprehensive plan. The plan describes water quality, water quality issues, and current and potential beneficial uses of water. The major components of the plan are beneficial uses, water quality objectives, implementation plans, and surveillance and monitoring.

4.3.2.6 Water Quality Control Plan for the Tulare Basin

The Tulare Basin WQCP was adopted in January 2014 and is a comprehensive plan. The plan describes surface and groundwater quality, water quality issues, and current and potential beneficial uses of water. The major components of the plan are beneficial uses, water quality objectives, implementation plans, plans and policies, and surveillance and monitoring. The plan addresses numerous water quality issues including; groundwater overdraft, agricultural chemical, well standards, oilfield waste water, and water transfers.

4.3.2.7 Central Valley Regional Water Quality Control Board Drinking Water Policy

A commitment of the CALFED Bay-Delta Program ROD was the development of a new drinking water policy for Delta waters. Currently, both the Bay-Delta WQCP and the Sacramento-San Joaquin Basin Plan lack numeric water quality objectives for several known drinking water constituents of concern, such as organic carbon and pathogens. In response to the CALFED commitment, the Central Valley RWQCB (CVRWQCB) is in the process of a multiyear effort to develop a drinking water policy for surface waters in the Central Valley. Existing policies and plans lack water quality objectives for several known drinking water constituents of concern, including DBP precursors and pathogens, and also lack implementation strategies to provide effective source water protection. The CVRWQCB Drinking Water Policy applies to Delta waters and any activities, such as discharges, that affect Delta water quality.

4.3.2.8 California Toxics Rule

As a result of a court-ordered revocation of California's statewide WQCP for priority pollutants in September 1994, CalEPA initiated efforts to promulgate additional numeric water quality criteria for California. In May 2000, CalEPA issued the CTR that promulgated numeric criteria for priority pollutants not included in the NTR. The CTR documentation carried forward the previously issued standards of the NTR, thereby providing a single document listing California's adopted and applicable water quality criteria for priority pollutants.

4.3.2.9 California Safe Drinking Water Act

In 1976, California enacted its own SDWA, requiring the Department of Public Health Services to regulate drinking water, including: setting and enforcing federal and State drinking water standards, administering water quality testing programs, and administering permits for public water system operations. The Federal SDWA allows the State to enforce its own standards in lieu of the federal standards so long as they are at least as protective as the federal standards. California's drinking water standards (e.g., MCLs) are the same or more stringent than the federal standards and include additional contaminants not regulated by the USEPA. Like the federal MCLs, California's primary MCLs address health concerns, while secondary MCLs address aesthetics, such as taste and odor. The California SDWA is administered by DPH primarily through a permit system.

4.4 Chapter 8: Fluvial Geomorphology and Riparian Habitat

4.4.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to fluvial geomorphology and riparian habitat, but are discussed in other section of this chapter, as indicated in parentheses:

- Coordinated Operations Agreement (Surface Water Resources)
- 2009 National Marine Fisheries Service Biological Opinion (Surface Water Resources)

4.4.1.1 Federal Endangered Species Act

FESA requires that both the USFWS and NMFS maintain lists of Threatened and Endangered Species. An "Endangered Species" is defined as "…any species which is in danger of extinction throughout all or a significant portion of its range." A "Threatened Species" is defined as "…any species that is likely to become an Endangered Species within the foreseeable future throughout all or a significant portion of its range". Section 9 of FESA makes it illegal to "take" (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct) any Endangered Species of fish, wildlife, or plants and contains similar provisions for most Threatened Species of fish, wildlife, and plants.

FESA also requires the designation of "critical habitat" for listed species. "Critical habitat" is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to a species' conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Section 7 of FESA requires all federal agencies to ensure that any action they authorize, fund, or carry-out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. To ensure against jeopardy, each federal agency must consult with USFWS or NMFS, or both, if the federal agency determines that its action might affect a listed species. NMFS' jurisdiction under FESA is limited to the protection of marine mammals, marine fish, and anadromous fish; all other species are within the jurisdiction of USFWS.

If an activity would result in the take of a federally listed species, one of the following is required: (1) an Incidental Take Permit issued as part of an approved Habitat Conservation Plan (HCP) under Section 10(a) of FESA; or (2) an Incidental Take Statement issued pursuant to federal interagency consultation under Section 7 of FESA. Such authorization typically requires various measures to avoid and minimize species take, and to protect the species and avoid jeopardy to the species continued existence.

Where a federal agency is not authorizing, funding, or carrying out a project, take that is incidental to the lawful operation of a project may be permitted pursuant to Section 10(a) of FESA through approval of an HCP.

U.S. Fish and Wildlife Service Operations Criteria and Plan Biological Opinion

On December 15, 2008, the USFWS issued its biological opinion on the Operations Criteria and Plan (OCAP). The USFWS concurred with Reclamation's determination that the coordinated operations of the CVP and the SWP are not likely to adversely affect listed species, with the exception of delta smelt. The USFWS concluded that the coordinated operations of the CVP and the SWP, as proposed, were likely to jeopardize the continued existence of the delta smelt, and adversely modify delta smelt critical habitat. Although the opinion identified a number of stressors that affect delta smelt which are unrelated to CVP and SWP operations, their effects could not be assessed. Consequently, the USFWS developed RPAs as alternative actions to avoid the likelihood of jeopardizing the continued existence or the destruction or adverse modification of critical habitat for delta smelt. These actions include: (1) preventing/reducing entrainment of delta smelt at Jones and Banks pumping plants; (2) providing adequate habitat conditions that will allow the adult delta smelt to successfully migrate and spawn in the Bay-Delta; (3) providing adequate habitat conditions that will allow larvae and juvenile delta smelt to rear; and (4) providing suitable habitat conditions that will allow successful recruitment of juvenile delta smelt to adulthood. In addition, USFWS specified that it is essential to monitor delta smelt abundance and distribution through continued sampling programs through the Interagency Ecological Program (IEP).

4.4.2 State Plans, Policies, and Regulations

4.4.2.1 Senate Bill 1086

Senate Bill (SB) 1086 created the Sacramento River Conservation Area Advisory Council. The legislation required the development of a Sacramento River management plan which promotes the protection, restoration, and enhancement of both fisheries and riparian habitat while ensuring that other community needs are met, including agricultural production, public safety, public and private infrastructure, economic stability, and public recreation. The plan, the *Upper Sacramento River Fisheries and Riparian Habitat Management Plan,* was published in 1989.

4.4.2.2 California Endangered Species Act of 1982

The California Endangered Species Act (CESA) declares that deserving plant or animal species will be given protection by the State because they are of ecological, educational, historical, recreational, aesthetic, economic, and/or scientific value to the people of California. CESA established that it is State policy to conserve, protect, restore, and enhance endangered species and their habitats. CESA pertains only to State-listed rare, threatened, or endangered plant and wildlife species. CESA requires State agencies to consult with CDFG when preparing CEQA documents to ensure that agency actions do not jeopardize State-listed species.

4.5 Chapter 9: Flood Control and Management

4.5.1 Federal Plans, Policies, and Regulations

4.5.1.1 Executive Order 11988, Floodplain Management

Executive Order (EO) 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities” for the following actions:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally-undertaken, -financed, or -assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

4.5.1.2 Clean Water Act Section 408

USACE’s §408 approval is required before approval and implementation of any proposed project that may affect any existing USACE (and/or Project) levee in the Central Valley and Delta. Section 2035 of the Federal Water Resources Development Act of 2007 requires that flood damage reduction projects be reviewed by independent experts if it is determined that a review is necessary to assure public health, safety, and welfare.

4.5.1.3 Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) is responsible for maintaining minimum federal standards for floodplain management within the United States and territories of the United States. As discussed below, FEMA plays a major role in managing and regulating floodplains. FEMA is responsible for management of floodplain areas, which are defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to a one percent or greater chance of flooding in any given year (the 100-year floodplain).

<u>**National Flood Insurance Program**</u>

The National Flood Insurance Program (NFIP) is administered primarily under two statutes: the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The Federal Insurance Administration under FEMA administers NFIP. NFIP has two main components: (1) floodplain management assistance and (2) flood insurance assistance. The purpose of flood insurance is to enable property owners to purchase insurance against losses from physical damage or the loss of buildings and their contents caused by floods, flood-related mudslides, or erosion. Insurance is available to property owners belonging to NFIP-participating communities. Participation in NFIP also makes communities eligible for federal flood disaster assistance. For a community to be eligible to participate in NFIP, the community must adopt a local floodplain management ordinance that meets or exceeds the minimum federal standards defined in 44 CFR 60 to 65. Participating communities must adhere to all floodplain management requirements, with oversight from FEMA, for all activities that may affect floodplains within the Special Flood Hazard Areas (SFHA).

Federal Emergency Management Agency Flood Zones

FEMA mapping provides important guidance in planning for flooding events and regulating development within identified flood hazard areas. FEMA's NFIP is intended to encourage State and local governments to adopt responsible floodplain management programs and flood measures. As part of the program, NFIP defines floodplain and floodway boundaries that are shown on Flood Insurance Rate Maps (FIRMs). DWR completed work to map the 200-year floodplain for many areas of California.

Flood Zone Regulations

SFHAs are subject to federal and State requirements, which are defined primarily by federal regulations at 44 CFR 60.3 and 44 CFR 65.12. The first citation requires the following:

These federal regulations are intended to address the need for effective floodplain management and provide assurance that the cumulative effects of floodplain encroachment do not cause more than a one foot rise in water surface elevation after the floodplain has been identified on the FIRM (local flood ordinances can set a more stringent standard). The absence of a detailed study or floodway delineation places the burden on the project proponent to perform an appropriate engineering analysis to prepare hydrologic and hydraulic analyses consistent with FEMA standards. These analyses would then be used to evaluate the proposed project together "with all other existing and anticipated development." Defining future anticipated development is difficult. The purpose of this requirement is to avoid inequitable encroachments into the floodplain.

FEMA Levee Design and Maintenance Regulations

For levees to be accredited by FEMA, and to allow communities to participate in Preferred Risk programs of NFIP, evidence must be provided that adequate design, operation, and maintenance systems are in place to provide reasonable assurance that protection from the base flood (one percent annual chance of exceedance or 100-year flood) exists. These requirements are outlined in 44 CFR, Volume 1, Chapter I, Part 65.10.

4.5.1.4 Federal Emergency Management Agency 100-year Protection Standard

The FEMA 100-year Protection Standard, often called the one percent annual chance flood level of protection, is based on criteria established in the CFR and is often used with established USACE criteria to meet certain freeboard, slope stability, seepage/under-seepage, erosion, and settlement requirements. Numerical hydrologic models are used to project surface water elevations at different locations in the rivers for the statistically probable 100-year flood event. Model runs are updated periodically to reflect changes in river bathymetry and historical hydrology. Meeting this level of flood protection means that communities will not require mandatory purchase of flood insurance for houses in the floodplain or be subject to building restrictions. This standard generally does not address seismic stability. Currently, FEMA 100-year criteria are based on historical conditions and do not include considerations for climate change or sea level rise. FEMA is currently completing a study on the *Impact of Climate Change on the National Flood Insurance Program* to determine how to accommodate these factors and the long-term implications.

4.5.1.5 U.S. Army Corps of Engineers

The following discussion provides an overview of USACE's regulatory responsibilities that apply to navigable waters and construction within the ordinary high water mark of other waters of the U.S. In addition, USACE constructs flood control and risk management projects and monitors their operations and maintenance. It also provides emergency response to floods. These functions are described below.

1936 Flood Control Act

USACE constructs local flood control and risk management projects and navigation projects. The Flood Control Act of 1936 established a nationwide policy that flood control on navigable waters or their tributaries is in the interest of the general public welfare and is, therefore, a proper activity of the federal government in cooperation with states and local entities. The 1936 Flood Control Act, its amendments, and subsequent legislation specify details of federal participation. Projects are either specifically authorized through legislation by Congress or through a small projects blanket authority. Typically, a feasibility study is done to determine federal interest before authorization or construction.

U.S. Army Corps of Engineers Rehabilitation and Inspection Program

The Rehabilitation and Inspection Program is a USACE program that provides for the inspection of flood-control projects, the rehabilitation of damaged flood-control projects, and the rehabilitation of federally authorized and constructed hurricane or shore-protection projects. Levees in the program are eligible for federally funded repair and rehabilitation for damage induced by flood events, provided funding is available. The project levees (those levees previously authorized or constructed under a federal flood-control project) are eligible for the program as long as the non-federal sponsor maintains the levees to certain federal standards. Repairs and rehabilitation are accomplished under provisions of Public Law 84-99, with some cost-sharing normally required for non-project levees. Non-project levees are managed and maintained by local districts, as opposed to project levees, which are part of a larger regional or State project, and managed and maintained by a federal or State agency.

Operations and Maintenance Controls, Flood Control Projects

The maintenance and operation of federal project levee structures is discussed in 33 CFR 208.10. According to these regulations, no improvement shall be passed over, under, or through the walls, levees, improved channels, or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his or her authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the function of the protective facilities. This regulation is the basis for requiring a permit prior to any construction at federal project levees. Types of alterations/modifications typically covered by a CFR 208 permit include bridges, pump houses, stairs, pipes, bike trails, and power poles.

Rivers and Harbors Act Section 14

33 United States Code 408 and Section 14 of the Rivers and Harbors Act provide that the Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the temporary occupation or use of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States. This permission will be granted by an appropriate real estate instrument in accordance with existing real estate regulations. This regulation is used to require permits prior to modifications of federal project levees. Types of alterations typically requiring a Section 408 permit are major modifications such as degradations, raisings, and realignments.

4.5.2 State Plans, Policies, and Regulations

4.5.2.1 Central Valley Flood Protection Board Approval

The Central Valley Flood Protection Board (CVFPB) was previously known as the Reclamation Board. In 1855, California passed the Reclamation District (RD) Act providing for the sale of swamp lands. RDs were formed and were regulated so that construction of levees occurred along hydrologic boundaries (rather than along property lines). Islands in the Delta are ringed with levees that have their own districts for maintenance.

The CVFPB mission is to control flooding along the Sacramento and San Joaquin rivers and their tributaries in cooperation with USACE; to cooperate with various federal, State, and local agencies in establishing, planning, constructing, operating, and maintaining flood control works; and to maintain the integrity of the existing flood control system and designated floodways through the CVFPB’s regulatory authority by issuing permits for encroachments.

CVFPB is a major sponsor of federal flood risk management projects. It shares in construction cost; provides lands, easements, and rights-of-way; and assumes responsibility for operation and maintenance. CVFPB also approves or denies plans for reclamation, dredging, or improvements that alter any project levee. It has the authority to approve or deny any land reclamation plan (related to public works) or flood protection that involves excavation near rivers and tributaries, and has legal responsibility for oversight of the entire Central Valley flood management system.

4.5.2.2 Assembly Bill 1200

Assembly Bill (AB) 1200 highlighted the complex Delta water issues. AB 1200 amends Section 139.2 of the Water Code to read “The department shall evaluate the potential impacts on water supplies derived from the Delta based on 50-, 100-, and 200-year projections for each of the following possible impacts on the Delta”: subsidence; earthquakes; floods; changes in precipitation, temperature, and ocean levels; or any combination of these impacts.

The bill directs DWR and CDFG to report to the Legislature and Governor on the potential impacts of levee failures on Delta water supplies, options to reduce the impacts of these factors, and options to restore salmon and other fisheries that use the Delta estuary.

In response to the bill, DWR and CDFG have issued a report, *Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento/San Joaquin Delta*, dated January 2008. This report summarizes the potential risks to water supplies in the Sacramento-San Joaquin Delta attributable to future subsidence, earthquakes, floods, and climate change, and identifies improvements to reduce the impacts and options to deliver water.

4.5.2.3 Department of Water Resources' FloodSAFE California Initiative

In January 2005, Governor Arnold Schwarzenegger called for improved maintenance, system rehabilitation, effective emergency response, and sustainable funding to lower flood risks in California. In 2006, DWR launched FloodSAFE California, a multifaceted program to improve public safety through integrated flood management. Water Code Section 9602 (added by SB 5) requires a minimum level of flood protection for urban areas in the Sacramento and San Joaquin river watersheds. These areas must be able to withstand flooding that has a one-in-200 annual chance of occurrence. State Propositions 1E and 84, with legislative direction, allocated 67 percent of FloodSAFE funds to the Central Valley and Delta for repairs and improvements to levees and flood projects. FloodSAFE goals include reducing the frequency and size of flooding of communities, reducing the consequences of flooding, and protecting and enhancing ecosystems.

4.5.2.4 The State Plan of Flood Control Descriptive Document

DWR completed the State Plan of Flood Control (SPFC) Descriptive Document (November 2010) to meet the legislative requirements of California Water Code §9614, in part, for the Central Valley Flood Protection Plan (CVFPP). The SPFC Descriptive Document provides the first complete inventory and description of the SPFC as defined in §9110(f) of the California Water Code:

> *"State Plan of Flood Control" means the State and federal flood control works, lands, programs, plans, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in §8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds authorized pursuant to Article 2 (commencing with §12648) of Chapter 2 of Part 6 of Division 6 for which the board or the department has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in §8361."*

The State-federal flood protection system comprises federally- and State-authorized projects for which the CVFPB or DWR has provided assurances of cooperation to the United States federal government. These CVFPB- or DWR-provided assurances, coupled with State authorization, are an important distinction for what constitutes the State-federal flood protection system. Other flood protection facilities in the Sacramento River and San Joaquin River watersheds that are not covered by assurances to the federal government from the CVFPB or DWR are not part of the State-federal flood protection system or SPFC, but are included in the Sacramento-San Joaquin River Flood Management System defined in the California Water Code §9611.

4.5.2.5 Senate Bill 5

SB 5, signed into law in October 2007, updates the California Health and Safety Code to require DWR to propose updated requirements to the California Building Standards Code. The requirements proposed for adoption and approval by the California Building Standards Commission would be for construction in areas protected by the facilities of the CVFPP where flood levels are anticipated to exceed three feet for the 200-year flood event. Before DWR proposes the amendments to the California Building Standards Code, the Department is to consult with the CVFPB, the Division of the State Architect, and the Office of the State Fire Marshal.

4.5.2.6 Assembly Bill 162

AB 162 requires the land use element of the general plan of any city or county located within the boundaries of the Sacramento-San Joaquin Drainage District to identify and annually review those areas covered by the general plan that are subject to flooding as identified by flood plain mapping prepared by FEMA or DWR. The bill also requires, upon the next revision of the housing element, on or after January 1, 2009, the conservation element of the general plan to identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for purposes of groundwater recharge and stormwater management.

This bill also requires, upon the next revision of the housing element, on or after January 1, 2009, the safety element to identify, among other things, information regarding flood hazards and to establish a set of comprehensive goals, policies, and objectives, based on specified information for the protection of the community from, among other things, the unreasonable risks of flooding.

4.5.2.7 California Water Code

The Senate and Assembly bills identified above have resulted in various changes and additions to the California Water Code, including Section 8609. Section 8609 states that the board may designate floodways throughout the Sacramento and San Joaquin rivers drainage to control encroachments in, and to preserve the flow regimens of, floodways for the purpose of protecting public improvements, lives, land use values, and improvements created in reliance upon historical flooding patterns. “Sacramento and San Joaquin Rivers drainage,” or equivalent language, means all lands currently and historically drained by the Sacramento River and the San Joaquin River and their tributaries and distributaries.

California Water Code, Division 3: Dams and Reservoirs

California Water Code, Division 3: Dams and Reservoirs requires DWRs Division of Safety of Dams (DSOD) to supervise the construction, maintenance, and operation of dams and reservoirs to safeguard life and property from injury due to failure. The code section further requires DWR to evaluate the possibility that a dam or reservoir might be endangered due to seepage, earth movement or other conditions and to require the dam or reservoir owner to take appropriate actions to remove the danger to life and property. Federally owned dams and reservoirs are not under State jurisdiction, except as noted under federal law.

Sacramento-San Joaquin River Basin Comprehensive Study

The Comprehensive Study, which has been undertaken as a collaborative effort between USACE and DWR, released the first interim report in late 2002. The CVFPB will provide the administrative structure of the plan developed per the Comprehensive Study.

Sacramento River Flood Control Project

The Sacramento River Flood Control Project (SRFCP) is actually six interrelated projects undertaken by USACE, including reservoirs constructed on major rivers, which constitute the largest flood control system in the State. Project facilities extend from north of Colusa County southward to the Sacramento-San Joaquin Delta, approximately 230 miles along the Sacramento River corridor. Levees and associated facilities of the SRFCP have been constructed along five rivers, 15 creeks and 13 sloughs. In addition, human-made or human-modified facilities include six bypasses and 11 channels.

Sacramento River Bank Protection Project

As authorized by the Flood Control Act of 1970, the Sacramento River Bank Protection Project (SRBPP) is an ongoing construction and maintenance project. The SRBPP provides protection for existing flood control infrastructure, including levees, of the SRFCP.

4.5.3 Regional and Local Plans, Policies, and Regulations

4.5.3.1 Glenn County General Plan

Section 5.25 of the Glenn County General Plan identifies the following policies to address potential flood hazards:

- Recognize the special status of lands located within the designated floodways adopted by the State Reclamation Board.
- Support efforts to revise the FEMA FIRMs for the areas around Hamilton City, Willows, and Orland in order to improve their accuracy.
- Endeavor to avoid areas subject to flooding when considering approval of new development.
- Require the installation of storm drain and other flood protection/prevention improvements as a condition of all new development approvals.
- Encourage the formation of a countywide service area or individual storm drain maintenance districts to finance and construct needed flood control improvements.

4.5.3.2 Colusa County General Plan

The Colusa County General Plan identifies the following policies related to flood protection:

- **SAFE-1:** Floodplains should generally be maintained as open space. In these areas, their use for agriculture, recreation, preservation of vegetation and wildlife habitat, and scenery should be encouraged.
- **SAFE-2:** Urban development should be discouraged in the 100-year floodplain. Any habitable structure which is permitted shall be built so that the first floor of living area is above the 100-year flood elevation.
- **SAFE-3:** No critical or high-occupancy structures such as schools, hospitals, police, facilities, or fire stations should be built within the 100-year floodplain.
- **SAFE-4:** The County should support coordinated efforts to maintain levees along the Sacramento River and the 2047 canal.
- **SAFE-5:** Flood control policies in the Community Services Element should be supported to reduce the hazards associated with flooding.

4.5.3.3 Colusa County Code, Chapter 33: Flood Damage Prevention

It is the purpose of this chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

(A) Protect human life and health;

(B) Minimize expenditure of public money for costly flood control projects;

(C) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

(D) Minimize prolonged business interruptions;

(E) Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone and sewer lines; and streets and bridges located in areas of special flood hazard;

(F) Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage,

(G) Ensure that potential buyers are notified that property is in an area of special flood hazard; and

(H) Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

To accomplish its purposes, this section includes methods and provisions to:

(A) Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

(B) Control filling, grading, dredging, and other development which may increase flood damage;

(C) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(D) Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters; and

(E) Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

A development permit shall be obtained before any construction or other development begins within any area of special flood hazard established in Section 33-3.2. Application for a development permit shall be made on forms furnished by the floodplain administrator and may include, but not be limited to: plans in duplicate drawn to scale showing the nature, location, dimensions, and elevation of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. Specifically, the following information is required:

(a) Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures in zone A, elevation of highest adjacent grade and proposed elevation of lowest floor of all structures; or

(b) Proposed elevation in relation to mean sea level to which any nonresidential structure will be flood-proofed, if required in Subsection 33-5.1(C)(3); and

(c) All appropriate certifications listed in Subsection 33.4.3(d) of this chapter; and

(d) Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

4.5.3.4 Colusa County Flood Control and Conservation District

The Colusa County Flood Control and Conservation District (District) is overseen by the County Board of Supervisors. The purpose of the District is to plan and obtain funding for flood control activities, measures, and projects within the County.

4.5.3.5 Colusa County Floodplain Administrator

The Colusa County Director of Public Works is appointed to administer, implement and enforce Chapter 33 (Flood Damage Prevention) of the Colusa County Code regulations relating to flood management.

The floodplain administrator must:

- Review all development permits to determine that all county, State, and federal permits have been obtained; that a development site is reasonably safe from flooding, and that the proposed development will not adversely alter existing base flood elevations
- Review other base flood data obtained from a federal, State, or other source before its use, and must submit the additional base flood data to the county for adoption
- Notify adjacent communities, DWR, the Federal Insurance Administration, and FEMA prior to the alteration or relocation of a watercourse
- Certify, maintain, and make available to the public documentation of floodplain development including lowest floor elevations and pad elevations for proposed structures, flood-proofing of non-residential structures, and floodway encroachments
- Make flood hazard map boundary location determinations

The floodplain administrator has the authority to take action to remedy code violations and to decide appeals regarding the enforcement and administration of Chapter 33 codes.

4.6 Chapter 10: Groundwater Resources

4.6.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to groundwater resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- National Environmental Policy Act (General)Federal Safe Drinking Water Act (42 USC 300f) (Surface Water Quality)
- Federal Antidegradation Policy (40 CFR 131.6) (Surface Water Quality)
- Clean Water Act (33 USC 1251–1376) (Surface Water Resources)

These regulations were not specifically promulgated to protect or administer regulations related to groundwater. However, their implementation may directly or indirectly affect groundwater conditions.

4.6.2 State Plans, Policies, and Regulations

The following State regulation is applicable to groundwater resources, but is discussed in another section of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)

California does not regulate the overall use, entitlement, and management of groundwater. Although statewide groundwater regulations have been considered several times in the past, the California Legislature considers groundwater management to be a local responsibility. Several State regulations do specifically address groundwater, and others include groundwater among other physical units, such as surface water. Most of the regulations that include groundwater among other regulated entities are presented in other sections. State regulations that specifically address groundwater as the primary objective or as a major component are presented below.

4.6.2.1 Area of Origin Statute Limitations (California Water Code 1220)

California Water Code 1220 prohibits the pumping of groundwater "for export within the combined Sacramento and Delta-Central Sierra Basins…unless the pumping is in compliance with a groundwater management plan that is adopted by [county] ordinance." The statute enables, but does not require, the board of supervisors of any county within any part of the combined Sacramento and Delta-Central Sierra Basin to adopt groundwater management plans (GWMPs).

4.6.2.2 Groundwater Management (Assembly Bill 3030)

AB 3030 (1992) enables local water agencies to develop and implement GWMPs to manage the groundwater resources in the jurisdiction of the participating parties. The State does not maintain a statewide program or mandate its implementation, but the legislation provides the guidelines and common framework through which groundwater management can be implemented. Groundwater management legislation was amended in 2002 with the passage of SB 1938, which provided additional groundwater management components supporting eligibility to obtain public funding for groundwater projects. In 2000, AB 3030 enabled the development of the Local Groundwater Assistance Grant Program which provides financial support to local public agencies that are developing groundwater management and monitoring programs in their area.

4.7 Chapter 11: Groundwater Quality

4.7.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to groundwater quality, but are discussed in other sections of this chapter, as indicated in parentheses:

- Federal Safe Drinking Water Act of 1974 (Surface Water Quality)
- Clean Water Act of 1977 (Surface Water Resources)
- Federal Antidegradation Policy (Surface Water Quality)
- Porter-Cologne Water Quality Control Act (Surface Water Resources)

4.7.2 State Plans, Policies, and Regulations

The following State regulations apply to groundwater quality, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Antidegradation Policy (Surface Water Quality)
- Water Quality Control Plan for California Regional Water Quality Control Board Central Valley Region (Surface Water Quality)
- Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Estuary (Surface Water Quality)
- Water Quality Control Plan for Tulare Lake Basin (Surface Water Quality)
- Water Quality Control Plan for the North Coast Region (Surface Water Quality)
- Water Quality Control Plan for the Sacramento/San Joaquin River Basins (Surface Water Resources)
- San Francisco Bay Basin Water Quality Control Plan (Surface Water Resources)

4.7.2.1 California Code of Regulations – Underground Storage Tanks and Oil or Gas Wells

Title 23, Division 3, Chapter 16, Article 7 of the California Code of Regulations (CCR) describes the underground storage tank closure requirements which shall be accomplished in order to protect water quality. The requirements for permanent closure in place or removal apply to those underground storage tanks in which the storage of hazardous substances has ceased and tanks will not be used, or are not intended for use, for the storage of hazardous substances within the next 12 consecutive months.

Title 14, Division 2, Chapter 4, Article 3 of the CCR describes the rules and regulations governing the environmental protection measures that shall be taken when plugging and abandoning oil or gas wells. Requirements include the removal of all tanks, above-ground pipelines, debris, and other facilities and equipment.

4.7.3 Regional and Local Plans, Policies, and Regulations

The following local regulations apply to groundwater quality, but are described in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.7.3.1 Glenn County Groundwater Ordinance and Management Plan

The Glenn County groundwater management area includes areas of the county where irrigated agriculture is conducted, which is subdivided into 17 sub-areas and managed by individual sub-area, rather than at a countywide level. The Glenn County GWMP is based on established basin management objectives for minimum groundwater levels, minimum water quality, and maximum inelastic subsidence.

4.7.3.2 Colusa County Groundwater Management Plan

The Colusa County GWMP describes the groundwater management goals, basin management objectives, specific actions that will be implemented to manage groundwater resources, and a detailed groundwater management process that will be followed to achieve the groundwater management goals at a county-wide level. The plan is intended to be implemented in concert with the adopted groundwater management plans of existing water and irrigation districts, reclamation districts, cities, and public utility districts.

4.8 Chapter 12: Aquatic Biological Resources

4.8.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to aquatic biological resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Federal Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)
- USFWS Operations Criteria and Plan Biological Opinion (Fluvial Geomorphology and Riparian Habitat)
- NMFS Operations Criteria and Plan Biological Opinion (Surface Water Resources)
- Clean Water Act (Surface Water Resources)
- Rivers and Harbors Act (Surface Water Quality)
- Central Valley Project Improvement Act (Surface Water Resources)
- National Environmental Policy Act (General)

4.8.1.1 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act is the principal law governing marine fisheries in the United States. The purpose of this federal act is to conserve and manage anadromous fishery resources of the United States. The act establishes eight Regional Fishery Management Councils to prepare, monitor, and revise fishery management plans, which will achieve and maintain the optimum yield from each fishery. In California, the Pacific Fishery Management Council (PFMC) is responsible for achieving the objectives of the statute. The Secretary of Commerce has oversight authority. The statute was amended in 1996 to establish a new requirement to describe and identify “essential fish habitat” (EFH) in each fishery management plan. EFH is defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH also includes all habitats necessary to allow the production of commercially valuable aquatic species, to support a long-term sustainable fishery, and contribute to a healthy ecosystem.

EFH has been established by the National Oceanic and Atmospheric Administration Fisheries for waters in California supporting anadromous fish. In 1999, the Pacific Fishery Management Council identified EFH for Central Valley Chinook salmon stocks to include the Sacramento and San Joaquin rivers.

4.8.1.2 U.S. Fish and Wildlife Service Recovery Plan for Sacramento-San Joaquin Delta Native Fishes

This recovery plan covers eight species of concern, including the delta smelt, longfin smelt, Sacramento splittail, Sacramento perch, green sturgeon, spring-, late fall-, and San Joaquin fall-run Chinook salmon. The basic goal of the plan is to establish self-sustaining populations of these species. The purpose and scope of the plan is to outline a strategy for the conservation and restoration of the Sacramento-San

Joaquin Delta that currently supports or has the potential to support Delta native fishes. It is intended to fulfill one of the primary purposes under Section 2 of FESA, which is to provide a means for the conservation of ecosystems upon which endangered and threatened species depend.

Since the Recovery Plan for Sacramento-San Joaquin Delta Native Fishes was released in 1996, new information regarding the status, biology, and threats to Delta native species has emerged. Ongoing revision of the plan will review the new information and develop a strategy for the conservation and restoration of Delta native fish through the identification of recovery actions that specifically address the threats to their existence.

4.8.1.3 National Marine Fisheries Service Recovery Planning for Salmon and Steelhead in California

In the Central Valley, NMFS is responsible for facilitating the development of recovery plans for:

- The Sacramento River Winter-run Chinook Salmon Evolutionarily Significant Unit (ESU)[22]
- The Central Valley Spring-run Chinook Salmon ESU
- Central Valley Steelhead Distinct Population Segment (DPS)
- The Southern DPS of North American Green Sturgeon

The California Central Valley Recovery Domain[23] extends from the upper Sacramento River Valley to the northern portion of the San Joaquin River Valley. The Public Draft Recovery Plan for the ESUs of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the DPS of Central Valley steelhead was released in October 2009. A recovery plan for green sturgeon will be developed in the future by NMFS.

The NMFS Technical Recovery Team has produced four documents on:

- Current and historical population distributions of winter- and spring-run Chinook salmon
- Historical population distributions of Central Valley steelhead
- Population viability
- Research and monitoring needs

These documents provided the foundation for the Public Draft Central Valley Salmonid Recovery Plan. The recovery plan's objective is to reintroduce salmonid populations in historic habitats and reduce threats to the populations.

For the Central Valley Chinook salmon ESUs and the steelhead DPS to achieve recovery, each diversity group must be represented, and population redundancy within the groups must be met to achieve diversity group recovery. Several priority recovery actions to address specific limiting factors were identified by NMFS to help meet recovery objectives:

- Protect and restore watershed and estuarine habitat complexity and connectivity

- Improve understanding of life stage survival through focused research and monitoring

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22 Evolutionary significant unit- a population of organisms that is considered distinct for the purpose of conservation. This term is functionally the same as a distinct population segment, but this term is primarily used by USFWS.
23 California Central Valley Recovery Domain extends from the upper Sacramento River Valley to the northern portion of the San Joaquin River Valley.

- Establish at least two additional populations of winter-run Chinook salmon that are spatially diverse and secure from natural and human-made threats
- Develop more effective and efficient federal and State mechanisms to correct already documented threats to listed salmonids
- Collaboratively balance water supply and allocation with fisheries' needs through improving criteria for water drafting, storage and dam operations, water right programs, development of passive diversion devices and/or offstream storage, elimination of illegal diversions (accusation of diverting water without an appropriate permit) in priority watersheds and streams, and other such opportunities
- Screen appropriate water diversions and provide adequate downstream flows
- Provide outreach to federal action agencies regarding FESA Section 7(a)(1) and carry out programs to conserve and recover federally listed salmonids
- Identify and treat point and non-point source pollution to streams from wastewater, agricultural practices, and urban environments

4.8.1.4 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) gives the U.S. Secretary of Interior the authority to provide assistance to federal, State, public, or private agencies in developing, protecting, rearing, or stocking all wildlife, wildlife resources, and their habitats. Under the FWCA, whenever waters of any stream or other water body are proposed to be impounded, diverted, or otherwise modified by any public or private agency under federal permit, that agency must consult with the USFWS and, in California, the CDFG.

4.8.1.5 Anadromous Fish Restoration Program

An important goal identified to meet the fish and wildlife purposes of the CVPIA is the broad goal of restoring natural populations of anadromous fish (e.g., Chinook salmon, steelhead, green sturgeon, white sturgeon, American shad, and striped bass) in Central Valley rivers and streams to double their recent average abundance levels. The Anadromous Fish Restoration Program strives to achieve this goal by directing the Secretary of the Interior to develop and implement a program to ensure the sustainability of anadromous fish in Central Valley Rivers and streams.

4.8.1.6 CALFED Bay-Delta Program

In 1994, CALFED was initiated to address long-standing and unresolved conflicts over water use in the Sacramento–San Joaquin Delta. It was a collaborative program of 23 federal and State agencies. Its goal was to restore the ecological health of the Delta while ensuring an adequate supply for Delta water users, including the CVP and SWP.

4.8.1.7 National Invasive Species Act of 1996

The National Invasive Species Act reauthorizes and amends the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 to mandate regulations to reduce environmental and economic impacts from invasive species and to prevent introduction and spread of aquatic nuisance species, primarily through ballast water[24].

4.8.1.8 Trinity River Restoration Program

The Trinity River Restoration Program (TRRP) was implemented in 2001 following the issuance of the TRRP ROD. The purpose of the TRRP is to restore and maintain the natural production of anadromous fish in the Trinity River Basin downstream of Lewiston Dam, including fishery restoration to pre-Trinity River Diversion (TRD) levels, and to meet the U.S. Government's tribal trust obligations. The TRRP includes actions that: (1) re-establish the natural physical processes that create and maintain high quality aquatic habitat; and (2) create spawning and rearing conditions downstream of the dams that best compensate for lost habitat upstream, including adequate water temperatures.

The goal of the TRRP is not to re-create pre-dam conditions; rather, the goal is to create a smaller, dynamic, alluvial channel exhibiting all the characteristics of the pre-dam river but at a smaller scale. This strategy is intended to best achieve the restoration goals and maintain the purpose and use of the TRD.

Components of the TRRP include flow management for geomorphic and riparian processes, flow management for temperature and habitat, channel and watershed restoration, coarse sediment management, and adaptive management and monitoring.

4.8.1.9 Central Valley Project Long-term Water Service Contracts and the State Water Project Operations Criteria and Plan

The long-term CVP and SWP OCAP serves as the operational standard by which Reclamation and DWR operate the CVP and SWP system. The OCAP describes how Reclamation and DWR operate the CVP and the SWP to divert, store, and convey water consistent with applicable law. Reclamation and DWR completed an update to the OCAP in 2008 to reflect recent operational and environmental changes occurring throughout the CVP and SWP system.

4.8.2 State Plans, Policies, and Regulations

The following State regulations are applicable to aquatic biological resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)
- California Environmental Quality Act (General)
- Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Surface Water Quality)

4.8.2.1 California Department of Fish and Game Code Section 1602 (Streambed Alteration)

Section 1602 of the CDFG Code states that any entity proposing to substantially divert or obstruct the natural flow or alter streambed materials, channel, or bank in any river, stream, or lake must provide a detailed description and map of the proposed project location, name and description of the river, stream, or lake affected by streamflow diversions, and copies of applicable local, State, or federal permits and/or other documents already issued. The regulatory definition of a stream is a body of water that flows at least

[24] Ballast water is the water inside the hull of a boat used to provide stability and prevent the boat from capsizing

periodically or intermittently through a bed or channel having banks and supports wildlife, fish, or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. CDFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

4.8.2.2 The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act

Enacted in 1988, the Salmon, Steelhead Trout and Anadromous Fisheries Program Act was implemented in response to reports that the natural production of salmon and steelhead in California had declined dramatically since the 1940s, primarily as a result of lost stream habitat on many streams in the State. The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act declares that it is the policy of the State of California to increase the State's salmon and steelhead resources, and directs CDFG to develop a plan and program that strives to double the salmon and steelhead resources (CDFG Code §6902(a)). It is also the policy of the State that existing natural salmon and steelhead habitat shall not be diminished further without offsetting the impacts of lost habitat (CDFG Code §6902(c)).

4.8.2.3 Natural Community Conservation Planning Act

The Natural Community Conservation Planning Act (NCCPA) authorizes the NCCP program to design projects for and promote conservation of natural communities, while accommodating compatible land use. The NCCP program is broader in its orientation and objectives than CESA and FESA. Both ESA laws are designed to identify and protect individual species that have already significantly declined in number; the primary objective of the NCCP program is to conserve natural communities at the ecosystem level while accommodating compatible land use. The program seeks to prevent the controversies and gridlock caused by species' being listed. The intention of the plan is to provide protection for natural communities and the endangered, threatened, candidate, or other species known, or reasonably expected to be found in those communities. It does this by focusing on the long-term stability of wildlife and plant communities. Working with landowners, environmental organizations, and other interested parties, a local agency oversees the numerous activities that compose the development of a conservation plan. CDFG and USFWS provide the necessary support, direction, and guidance to NCCP participants.

4.8.2.4 California Department of Fish and Game Code Section 5937 (Flows Below Dams)

Fish and Game Code 5937 states that "the owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. During the minimum flow of water in any river or stream, permission may be granted by the department to the owner of any dam to allow sufficient water to pass through a culvert, waste gate, or over or around the dam, to keep in good condition any fish that may be planted or exist below the dam, when, in the judgment of the department, it is impracticable or detrimental to the owner to pass the water through the fishway."

4.8.2.5 California Department of Fish and Game Code Sections 5980–5993 (Fish Screening)

Sections 5980 to 5993 of the CDFG Code states that conduits with a maximum flow capacity greater than 250 cubic feet per second of water must be examined by CDFG. It is the responsibility of the owner of a conduit to install a screen when deemed by CDFG that it is necessary to prevent fish from passing into the conduit.

4.8.2.6 California Aquatic Invasive Species Management Plan

The California Aquatic Invasive Species Management Plan proposes management actions for addressing aquatic invasive species threats to the State of California. It focuses on the nonnative algae, crabs, clams, fish, plants and other species that continue to invade California's creeks, wetlands, rivers, bays and coastal waters.

4.8.3 Regional and Local Plans, Policies, and Regulations

4.8.3.1 Interagency Ecological Program Pelagic Organism Decline Studies and the CALFED State of the Bay-Delta Science Report

Since late 2004, scientific and public attention has focused on the unexpected decline of several pelagic (open-water) fishes (delta smelt, longfin smelt, juvenile striped bass, and threadfin shad) in the freshwater portion of the estuary known as the Delta. This decline has collectively become known as the Pelagic Organism Decline (POD). In 2005, the IEP formed a multi-agency POD Management Team tasked with designing and managing a comprehensive study to evaluate the causes of the decline and to synthesize and report the results. The IEP POD Team investigated three possible causes of POD (water project operations, contaminants, and invasive species). Final reports from the POD Management Team were issued in 2005 through 2010.

4.8.3.2 Delta Vision Strategic Plan

The intent of the Delta Vision Strategic Plan (Delta Vision) process is to identify a strategy for managing the Delta as a sustainable ecosystem that will continue to support environmental and economic functions which are critical to the people of California. The Delta Vision Blue Ribbon Task Force (Task Force), a Governor Schwarzenegger appointed panel, is charged with developing recommendations on priority actions that should be taken to achieve a sustainable Delta in the long-term. The Delta Vision has a broader focus than the CALFED Ecosystem Restoration Program, and the Task Force will issue recommendations that address the full array of natural resources, infrastructure, land use, and governance issues necessary to achieve a sustainable Delta. The Delta Vision is based on a growing consensus that:

(1) Environmental conditions and the current water conveyance configuration of the Delta are not sustainable for environmental and economic purposes

(2) Current land and water uses and related services dependent on the Delta are not sustainable based on current management practices and regulatory requirements

(3) Major "drivers of change" (e.g., seismic events, land subsidence, sea level rise, regional climate change, and urbanization) will impact the Delta in the future

(4) The current fragmented and complex governance systems within the Delta are not conducive to effective management of the Delta in light of these threats

(5) Failure to address these challenges and threats could result in significant environmental and economic consequences

The Task Force formulated seven goals. In addition to addressing legal actions and establishing a new governing structure, the goals recognize that enhancing the Delta's cultural, recreational, and agricultural values, and promoting statewide water conservation, would lead to improved water conveyance, storage, and operations; reduced risk; and ultimately, restoration of the ecosystem.

4.8.3.3 State Water Resources Control Board and the California Environmental Protection Agency Draft Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem

The SWRCB and CalEPA Draft Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem report (was produced in accordance with Water Code §85086. Water Code §85086, contained in the Delta Reform Act, was enacted as part of the comprehensive package of water legislation adopted in November 2009. Water Code §85086 requires the SWRCB to use the best available scientific information and a public process to develop new flow criteria for the Delta ecosystem to protect aquatic resources in the Delta. The purpose of the flow criteria is to inform planning decisions for the Delta Plan and the Bay Delta Conservation Plan. None of the determinations in the SWRCB Delta Flow Criteria Report have regulatory adjudicatory effect. The report includes flow criteria recommendations for the Sacramento River.

4.9 Chapter 13. Botanical Resources

4.9.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to botanical resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- National Environmental Policy Act (General)
- Federal Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)

4.9.1.1 Executive Order 11312: Invasive Species

EO 11312 directs all federal agencies to prevent and control introductions of invasive nonnative species in a cost-effective and environmentally sound manner to minimize their economic, ecological, and human health impacts. EO 11312 established a national Invasive Species Council made up of federal agencies and departments and a supporting Invasive Species Advisory Committee composed of State, local, and private entities. The Invasive Species Council and Advisory Committee oversee and facilitate implementation of the EO, including preparation of a National Invasive Species Management Plan.

4.9.2 State Plans, Policies, and Regulations

The following State regulations are applicable to botanical resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)
- California Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)

4.9.2.1 California Native Plant Society List

According to CDFG, species on California Native Plant Society (CNPS) Lists 1 or 2 must be treated as equivalent to State-listed species if they meet the definition of rare or endangered pursuant to CEQA §15380. CNPS states that "all of the plants constituting List 1B and List 2 meet the definitions of Sec.

1901, Chapter 10 (National Plant Protection Act) or Secs. 2062 and 2067 (CESA) of the CDFG Code, and are eligible for State listing. It is mandatory that they be fully considered during preparation of environmental documents relating to CEQA".

4.9.2.2 Natural Communities Conservation Planning Act

Sections 2800 to 2835 of the CDFG Code detail the State's policies on the conservation, protection, restoration, and enhancement of the State's natural resources and ecosystems. The intent of the legislation is to provide for conservation planning as an officially recognized policy that can be used as a tool to eliminate conflicts between the protection of the State's natural resources and the need for growth and development. In addition, the legislation promotes conservation planning as a means of coordination and cooperation among private interests, agencies, and landowners, and as a mechanism for multispecies and multi-habitat management and conservation.

4.9.2.3 California Department of Fish and Game Code Sections 1900 to 1913 – Native Plant Protection Act

The purpose of this regulation is to preserve, protect, and enhance endangered or rare native plants. The regulation states that CDFG shall establish criteria for determining if a native plant is endangered or rare through botanical research and field investigations, and the Fish and Game Commission may then designate endangered and rare plants. Designated endangered or rare plants shall not be taken or possessed.

4.9.2.4 Sections of the California Fish and Game Code Pertaining to Invasive and Noxious Plant Species

At least five code sections and their associated regulations address or relate to invasive and noxious plant species. These include CDFG Code Sections 2080 to 2089, 2118, 2270 to 2272, 2300, 6400 to 6403, 15000 et seq. The intent of these code sections is to regulate the importation and transportation of live wild animals and plants; restrict the placement of live aquatic animals or plants in State waters; and regulate the operation of aquaculture industries.

4.9.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to botanical resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.9.3.1 Colusa County Voluntary Oak Woodlands Management Plan

The purpose of Colusa County's Oak Woodland Management Plan is to provide a consistent policy for conservation and use of oak woodlands throughout the county. The document is expected to provide direction to landowners, the Colusa County Planning Department, and developers.

4.10 Chapter 14: Terrestrial Biological Resources

4.10.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to terrestrial biological resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- National Environmental Policy Act (General)
- Central Valley Project Improvement Act (Surface Water Resources)
- Federal Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)
- Fish and Wildlife Coordination Act (Aquatic Biological Resources)
- Executive Order 11312: Invasive Species (Botanical Resources)

4.10.1.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the U.S. Department of the Interior (DOI).

4.10.1.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (Eagle Act, as amended) prohibits the take of bald and golden eagles including individuals, parts, nests, eggs, nest trees, and nest territories.

4.10.2 State Plans, Policies, and Regulations

The following State regulations are applicable to terrestrial biological resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)
- California Endangered Species Act (Fluvial Geomorphology and Riparian Habitat)

4.10.2.1 California Department of Fish and Game Code 3503

This CDFG Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.

4.10.2.2 California Department of Fish and Game Code 3503.5

This CDFG Code states it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.

4.10.2.3 California Department of Fish and Game Code 3511

(a) (1) Except as provided in Section 2081.7 or 2835, fully protected birds or parts thereof may not be taken or possessed at any time. The following are fully protected birds:

(1) American peregrine falcon (*Falco peregrinus anatum*).
(2) Brown pelican (*Pelicanus occidentalis*).
(3) California black rail (*Laterallus jamaicensis coturniculus*).
(4) California clapper rail (*Rallus longirostris obsoletus*).
(5) California condor (*Gymnogyps californianus*).

(6) California least tern (*Sterna albifrons browni*).
(7) Golden eagle (*Aquila chrysaetos*).
(8) Greater sandhill crane (*Grus canadensis tabida*).
(9) Light-footed clapper rail (*Rallus longirostris levipes*).
(10) Southern bald eagle (*Haliaeetus leucocephalus leucocephalus*).
(11) Trumpeter swan (*Cygnus buccinator*).
(12) White-tailed kite (*Elanus leucurus*).
(13) Yuma clapper rail (*Rallus longirostris yumanensis*).

4.10.2.4 California Department of Fish and Game Code 4700

(a) (1) Except as provided in Section 2081.7 or 2835, fully protected mammals or parts thereof may not be taken or possessed at any time. The following are fully protected mammals:

(1) Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*).
(2) Bighorn sheep (*Ovis canadensis*), except Nelson bighorn sheep (subspecies *Ovis canadensis nelsoni)* as provided by subdivision (b) of Section 4902.
(3) Northern elephant seal (*Mirounga angustirostris*).
(4) Guadalupe fur seal (*Arctocephalus townsendi*).
(5) Ring-tailed cat (Bassariscus *astutus*).
(6) Pacific right whale (*Eubalaena sieboldi*).
(7) Salt-marsh harvest mouse (*Reithrodontomys raviventris*).
(8) Southern sea otter (*Enhydra lutris nereis*).
(9) Wolverine (*Gulo luscus*).

4.10.2.5 California Department of Fish and Game Code 5050

(a) (1) Except as provided in Section 2081.7 or 2835, fully protected reptiles and amphibians or parts thereof may not be taken or possessed at any time. The following are fully protected reptiles and amphibians:

(1) Blunt-nosed leopard lizard (*Crotaphytus wislizenii silus*).
(2) San Francisco garter snake (*Thamnophis sirtalis tetrataenia*).
(3) Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*).
(4) Limestone salamander (*Hydromantes brunus*).
(5) Black toad (*Bufo boreas exsul*).

4.10.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to terrestrial biological resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Colusa County General Plan (General)
- Glenn County General Plan (General)
- Colusa County Voluntary Oak Woodlands Management Plan (Botanical Resources)

4.11 Chapter 15: Wetlands and Other Waters of the U.S.

4.11.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to wetlands and other waters of the U.S., but are discussed in other sections of this chapter, as indicated in parentheses:

- Clean Water Act Sections 401 and 404 (Surface Water Resources, Surface Water Quality)
- Rivers and Harbors Act of 1899 (Surface Water Quality)
- Natural Communities Conservation Planning Act (Botanical Resources)

4.11.1.1 Executive Order 11990, Protection of Wetlands

EO 11990 requires each federal agency to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands which are under their jurisdiction. Further, the agencies are directed to avoid undertaking or providing assistance for any new construction located in wetlands unless the head of the agency finds that there is no practicable alternative to such construction and that the proposed action includes all practicable measures to minimize harm to the affected wetlands.

4.11.1.2 No Net Loss of Wetlands Policy

"No net loss" is the United States government's overall policy goal regarding wetlands preservation. The goal of the policy is to balance wetland loss due to economic development with wetlands reclamation, mitigation, and restorations efforts, so that the total acreage of wetlands in the country does not decrease, but remains constant or increases. No net loss as a goal for wetland's policy was recommended at the National Wetlands Policy Forum in 1987 and was first adopted by President George H.W. Bush administration in 1989. The policy, which represented compromise between development and conservation, was grounded on the needs to protect the wetlands by creating and restoring the wetlands.

4.11.1.3 Comprehensive Conservation Plans for National Wildlife Refuges

USFWS is directed to develop Comprehensive Conservation Plans (CCPs) to guide the management and resource use for each refuge of the National Wildlife Refuge System under requirements of the National Wildlife Refuge Improvement Act of 1997. Refuge planning policy also directs the process and development of CCPs. A CCP provides a description of the desired future conditions and long-range guidance necessary for meeting refuge purposes. It also guides management decisions and sets forth strategies for achieving refuge goals and objectives within a 15-year time frame.

4.11.2 State Plans, Policies, and Regulations

The following State regulations are applicable to wetlands and waters of the U.S., but are discussed in other sections of this chapter, as indicated in parentheses:

- Porter-Cologne Water Quality Control Act (Surface Water Resources)
- Suisun Marsh Preservation Agreement (Surface Water Resources)
- Suisun Marsh Protection Act and Suisun Marsh Protection Plan (Surface Water Resources)
- Delta Vision Strategic Plan (Aquatic Biological Resources)
- Delta Protection Act of 1992 (Surface Water Resources)

4.11.2.1 California Wetlands Conservation Policy

The goal of the California Wetlands Conservation Policy, adopted in 1993, is to ensure no overall net loss, and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California, in a manner that fosters creativity, stewardship, and respect for private property.

4.11.3 Regional and Local Plans, Policies, and Regulations

4.11.3.1 Yolo Bypass Wildlife Area Land Management Plan

The Yolo Bypass Wildlife Area Land Management Plan was finalized in June 2008. The management plan is a general policy guide for the CDFG to manage the Yolo Bypass Wildlife Area. It is intended to contribute to habitat management that uses natural processes to create a sustainable system over the long term. The policies are based on an ecosystem approach to habitat management consistent with the principles of CALFED's Ecosystem Restoration Program, as implemented by the USFWS, NMFS, and CDFG.

4.12 Chapter 16: Geology, Minerals, Soils, and Paleontology

4.12.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to geology, minerals, soils, and/or paleontology, but are discussed in other sections of this chapter, as indicated in parentheses:

- Clean Water Act Section 402, National Pollution Discharge Elimination System Permits (Surface Water Quality)
- National Pollution Discharge Elimination System General Permit for Stormwater Discharges from Construction Sites (Surface Water Quality)

4.12.1.1 Antiquities Act of 1906

The Antiquities Act authorizes the President of the United States to designate National Monuments and provides criminal penalties (fines and/or imprisonment) for the unauthorized excavation, injury, or destruction of prehistoric or historic ruins and objects of antiquity located on federal land. This act applies to the public lands administered by federal agencies.

4.12.1.2 Archaeological Resources Protection Act of 1979 (16 USC 470aa to mm)

The Archaeological Resources Protection Act (ARPA) amends the Antiquities Act, sets a broad policy that archaeological resources are important to the nation and should be protected, and requires special permits before the excavation or removal of archaeological resources from federally managed lands and Indian lands. This act is applicable to public lands within the project boundary that are managed by federal agencies. ARPA also provides for maintaining the confidentiality of information on the nature and location of archaeological sites.

4.12.1.3 Omnibus Public Land Management Act of 2009

On March 31, 2009, President Obama signed into law the Omnibus Public Land Management Act (OPLMA) of 2009. Title 6, Subtitle D of the OPLMA, Paleontological Resources Preservation, requires the secretaries of the DOI (exclusive of Indian trust lands) and the U.S. Department of Agriculture (USDA) (insofar as U.S. Forest System lands are concerned) to "… manage and protect paleontological resources on Federal land using scientific principals and expertise… [and] develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources …" The OPLMA further excludes casual collection from restrictions under the law, and then describes the requirements for permitting collection on federal lands, stipulations regarding the use of paleontological resources in education, continued federal ownership of recovered paleontological resources, and standards for acceptable repositories of collected specimens and associated data. The OPLMA also provides for criminal and civil penalties for unauthorized removal of paleontological resources from federal land, and for rewards for reporting the theft of fossils.

4.12.2 State Plans, Policies, and Regulations

The following State regulations are applicable to geology, minerals, soils, and/or paleontology, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)
- Porter-Cologne Water Quality Control Act (Surface Water Resources)
- California Department of Fish and Game Code 1602 (Aquatic Biological Resources)
- California Water Code, Division 3: Dams and Reservoirs (Flood Control and Management)

4.12.2.1 Surface Mining and Reclamation Act of 1975 (Public Resources Code 2762 and 2714)

Mining activities are regulated in the State of California by the Surface Mining and Reclamation Act (SMARA) of 1975. This law's purpose is to create and maintain an effective and comprehensive surface mining and reclamation policy with regulation of surface mining operations to ensure that adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition that is readily adaptable for alternative land uses. Production and conservation of minerals are encouraged, and consideration is given to values relating to recreation, wildlife, range and forage, and aesthetic enjoyment, while eliminating residual hazards to public health and safety. These goals are achieved through land use planning by allowing jurisdictions to balance the economic benefits of resource extraction with the need to provide other land uses.

It is also the intent of this process, through the adoption of local mineral resource management policies, that significant mineral resources be considered in future local land-use planning decisions. Public Resources Code Section 2762 directs that if a use is proposed that might threaten the potential recovery of minerals from an area that has been classified MRZ-2 (areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists), the county (or city) must specify its reasons for permitting use, provide public notice of those reasons, and forward a copy of its statement of reasons to the State Geologist and the State Mining and Geology Board.

4.12.2.2 Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 was passed following the Loma Prieta earthquake to reduce threats to public health and safety by identifying and mapping known seismic hazard zones in California. The act directs the California Geological Survey of the Department of Conservation to identify and map areas prone to earthquake hazards of liquefaction[25], earthquake-induced landslides, and amplified ground shaking. The purpose of the maps is to assist cities and counties in fulfilling their responsibilities for protecting public health and safety.

4.12.2.3 Asbestos Airborne Toxic Control Measure for Surfacing Applications (amended 2000)

This California Air Resources Board (ARB) regulation serves to control the sale, use, or transport of materials derived from ultramafic (high in magnesium and iron) or serpentine[26] sources with the goal of reducing airborne emissions of asbestos found in these materials. The regulation does not include aggregate materials derived from alluvial sources.

4.12.2.4 Asbestos Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations 2002

This ARB regulation serves to limit ground disturbance in areas containing ultramafic rock or areas containing naturally occurring asbestos or serpentine.

4.12.2.5 Regulatory Design Codes for Buildings, Highways, and Other Structures

State and federal standards for minimum design regulate the construction of any buildings, highways, and other structures, and include the following:

- American Association of State Highway and Transportation Officials (AASHTO) Guide Specifications for Load and Resistance Factor Design (LRFD) Seismic Bridge Design, 1st Edition, 2009
- American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering, Volume 2, Chapter 9, Seismic Design for Railway Structures, 2008
- American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures, ASCE-7-05, 2005
- California Amendments to AASHTO LRFD Bridge Design Specifications, Fourth Edition, 2008
- California Building Code (CBC), 2013 (CCR, Title 24, Part 2)
- Caltrans Seismic Design Criteria, latest edition
- DWR DSOD Guidelines for Use of the Consequence-Hazard Matrix and Selection of Ground Motion Parameters, 2002
- DWR Interim Levee Design Criteria for Urban and Urbanizing Area State-Federal Project Levees, 2009
- Federal Highway Administration (FHWA) Seismic Retrofitting Manual for Highways Structures, Parts 1 and 2, 2006
- USACE (Corps, CESPK-ED-G), Geotechnical Levee Practice, SOP EDG-03, 2004
- USACE Design and Construction of Levees, EM 1110-2-1913, 2000

25 Liquefaction- the process by which saturated, unconsolidated sediments are transformed into a substance that acts like a liquid. Earthquakes can cause soil liquefaction where loosely packed, water-logged sediments come loose from the intense shaking of the earthquake.
26 Serpentine- a mineral or rock consisting essentially of a hydrous magnesium silicate usually having a dull green color and often a mottled appearance

- USACE Engineering and Design, Earthquake Design and Evaluation for Civil Works Projects, ER 1110-2-1806, 1995
- USACE Engineering and Design – Earthquake Design and Evaluation of Concrete Hydraulic Structures, EM 1110-2-6053, 2007
- USACE Engineering and Design – General Design and Construction Considerations for Earth and Rock-Fill Dams, EM 1110-2-2300, 2004
- USACE Engineering and Design – Response Spectra and Seismic Analysis for Concrete Hydraulic Structures, EM 1110-2-6050,1999
- USACE Engineering and Design – Stability Analysis of Concrete Structures, EM 1110-2-2100, 2005
- USACE Engineering and Design – Structural Design and Evaluation of Outlet Works, EM 1110-2-2400, 2003
- USACE Engineering and Design – Time-History Dynamic Analysis of Concrete Hydraulic Structure, EM 1110-2-6051, 2003
- USACE Slope Stability, EM 1110-2-1902, 2003
- Reclamation. ACER Technical Memo No. 3. Criteria and Guidelines for Evacuating Storage Reservoirs and Sizing Low-Level Outlet Works, 1990.
- DOI and USGS Climate Change and Water Resources Management: A federal Perspective, Circular 1331

These standards establish minimum design criteria and construction requirements, including design of concrete and steel structures, levees, tunnels, pipelines, buildings, pumping stations, excavation and shoring, grading, and foundations.

4.12.2.6 Nonpoint Source Implementation and Enforcement Policy

The State's Nonpoint Source Implementation and Enforcement Policy describes how its nonpoint source plan is to be implemented and enforced, in compliance with Section 319 of the CWA (the Nonpoint Source Management Program), Coastal Zone Act Reauthorization Amendments, and the Porter-Cologne Act. In contrast to point-source pollution that enters water bodies from discrete locations, nonpoint source pollution enters water bodies from diffuse sources, such as land runoff, seepage, or hydrologic modification. Nonpoint source pollution is controlled through implementation of management measures such as operational controls. The nonpoint source pollution program contains recommended management measures for developing areas and construction sites, as well as wetland and riparian areas. Requirements for soil erosion and sediment controls to prevent nonpoint source pollution discharges to waterways may be incorporated into permits.

4.12.2.7 California Public Resources Code Chapter 1.7 Archaeological, Paleontological, and Historical Sites Section 5097.5)

(a) No person shall knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands. Violation of this section is a misdemeanor.

(b) As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the State, or any city, county, district, authority, or public corporation, or any agency thereof.

4.12.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to geology, minerals, soils, and/or paleontology, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.13 Chapter 17. Faults and Seismicity

4.13.1 Federal Plans, Policies, and Regulations

4.13.1.1 National Earthquake Hazards Reduction Program Act of 2004

This act established the National Earthquake Hazards Reduction Program which was designed to develop and promote effective measures for earthquake hazard reductions, serve as a clearinghouse for data and standards related to earthquake effects on communities and structures, and to develop, operate and maintain the Advanced National Seismic Research and Monitoring System.

4.13.2 State Plans, Policies, and Regulations

The following State regulations are applicable to faults and seismicity, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Water Code, Division 3 Dams and Reservoirs (Flood Control and Management)
- Seismic Hazards Mapping Act of 1990 (Geology, Minerals, Soils, and Paleontology)

4.13.2.1 Alquist-Priolo Earthquake Fault Zoning Act of 1972

This act requires the State Geologist to provide maps of Earthquake Fault Zones to affected city, county, and State agencies to avoid development of structures for human occupancy across the trace of active faults. The act also facilitates the seismic retrofitting of existing buildings, including historic buildings, against ground shaking.

4.13.2.2 California Division of Mines and Geology Special Publication No. 42, Fault-Rupture Hazard Zones in California, 2007

Pursuant to the Alquist-Priolo Earthquake Fault Zoning Act, this report summarizes the various responsibilities under the Act, details the actions taken by the State Geologist and his staff to implement the Act, and provides earthquake fault zone maps.

4.13.2.3 California Division of Mines and Geology Special Publication No. 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008

Pursuant to the Seismic Hazards Mapping Act, this report presents guidelines for evaluating seismic hazards other than surface fault-rupture, and recommends mitigation measures as required by Public Resources Code Section 2695(a).

4.13.2.4 California Code of Regulations, Title 23 Waters, Division 2 DWR, Chapter 1 Dams and Reservoirs, Article 5

This section of the CCR states that, pursuant to Section 6056 of the Water Code, the DWR shall retain a board of three consultants to report to the Director on the safety of dams owned by DWR. The consulting board shall make independent findings with regard to conditions which may affect the safety of the dam and reservoir as specified in Section 6081 of the Water Code, and the board shall also make independent findings that the dam is safe to impound water, as specified in Section 6355 of the Water Code.

This section also states that DWR shall retain a consulting board (1) to review the adequacy of the design of a dam and reservoir DWR proposes to construct, or (2) to review the safety of the completed construction and the terms and conditions to be included in a certificate of approval for any dam owned by DWR as issued, renewed or modified, no later than six months following any such action. Where a board is retained to review the adequacy of the design of a dam and reservoir, it shall report its findings to the Director prior to the approval of an application to construct or enlarge the dam.

In addition, DWR shall retain a review board at least once every five years to review the operational performance of department owned dams. The Federal Power Commission’s five year independent review may be substituted if it is comparable to the review required by this article.

4.13.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to faults and seismicity, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.14 Chapter 18: Cultural Resources

4.14.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to cultural resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Antiquities Act of 1906 (Geology, Soils, Minerals, and Paleontology)
- Archaeological Resources Protection Act (Geology, Soils, Minerals, and Paleontology)

4.14.1.1 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations require federal agencies to consider the effects of their undertakings, or those they fund or permit, on properties that may be eligible for listing, or that are listed in the National Register of Historic Places (NRHP). The 36 CFR Part 60.4 regulations describe the criteria to evaluate cultural resources for inclusion in the NRHP. Cultural resources can be significant on the national, State, or local level. Such resources are required to retain integrity and must exhibit an association with broad patterns of our history, be associated with an important person, embody a distinctive characteristic, or yield information that is historically significant.

The 36 CFR Part 800 regulations, implementing Section 106, call for considerable consultation with the State Historic Preservation Officer, Indian tribes, and interested members of the public throughout the process. The four principal steps are as follows:

- Initiate the Section 106 process
- Identify historic properties, resources eligible for inclusion in the NRHP
- Assess the effects of the undertaking to historic properties in the Area
- Resolve adverse effects

4.14.1.2 National Register of Historic Places

The NRHP is the official list of the Nation's historic places worthy of preservation. To be eligible for the register, the property must meet criteria related to age, integrity, and significance. All nominations to the register are reviewed by the State Office of Historic Preservation.

The NRHP is maintained by the Secretary of the Interior and includes districts, sites, buildings, structures, architecture, archaeology, engineering, culture, and objects of significance in American history. A property may be listed in the NRHP if it meets criteria for evaluation defined in 36 CFR 60.4:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

(A) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(B) That are associated with the lives of persons significant in our past; or

(C) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess an artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) That have yielded, or may be likely to yield, information important to prehistory or history.

4.14.1.3 Protection of Historic Properties (USC 36 CFR 800)

This code section requires federal agencies to consider the effects of their undertakings on historic properties. Consultation early in the planning process allows identification of properties potentially affected by the undertaking and the development of measures to avoid, minimize, and mitigate adverse effects on historic properties.

4.14.1.4 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) provides for increased involvement of Native Americans in archaeology and historic preservation. NAGPRA addresses the rights of lineal descendants and Indian tribes to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony. These parties are to be consulted when such items are inadvertently discovered or intentionally excavated on federal or tribal lands. NAGPRA recognizes Native American "ownership" of these items. The NHPA amendments mandate tribal participation in the Section 106 process. A federal agency must consult with the tribal government or recognized representatives when its activities occur on a reservation and/or as part of an undertaking. Agencies also must consult with a tribe if an activity will affect a historic property to which the tribe attaches cultural or historic importance. More importantly, tribal historic preservation programs have the same legal status as State historic preservation programs. These stipulations are an acknowledgment that tribal sovereignty extends into the arena of cultural resource management and, therefore, are an extension of the government-to-government relationship between tribes and the federal government. The NHPA amendments also specify that "properties of traditional religious and cultural importance to Native Americans" qualify for inclusion in the NRHP. To a certain extent, this specification addresses the inability of the AIRFA to protect Native American sacred sites. This designation also expands the definition of "cultural resource" to include sites that may lack material remains.

4.14.2 State Plans, Policies, and Regulations

The following State regulations are applicable to cultural resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)
- California Public Resources Code Chapter 1.7 Archaeological, Paleontological, and Historical Sites Section 5097.5 (Geology, Soils, Minerals, and Paleontology)

4.14.2.1 California Register of Historical Resources

The California Register of Historical Resources (CRHR) includes resources that are listed in or formally determined eligible for listing in the NRHP, as well as some California State Landmarks and Points of Historical Interest. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA, unless a preponderance of evidence indicates otherwise. The eligibility criteria for listing in the CRHR are similar to those for NRHP listing, but focus on the importance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if:

1. It is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or
2. It is associated with the lives of persons important to local, California, or national history; or
3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values; or
4. It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

4.14.2.2 California Native American Historic Resource Protection Act

The California Native American Historic Resource Protection Act establishes the Native American Heritage Commission (NAHC) and its responsibilities and requires cooperation of State and local agencies in carrying out its duties with respect to Native American resources. The NAHC identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items. In the event of the discovery of human remains of Native American origin, the NAHC is responsible for the identification of the person or persons it believes to be the most likely descendant from the deceased Native American.

4.14.2.3 California Public Resources Code Section 5024.1

The Code Section requires State agencies to formulate policies to preserve and maintain State-owned historical resources under its jurisdiction. This includes those resources included in the NRHP as well as those resources potentially eligible for the register.

4.14.2.4 California Public Resources Code Section 5097.9-5097.991

These code sections provide protection to the exercise of Native American religion including protection of cemeteries, places of worship, religious or ceremonial sites, or sacred shrines on public property. City and County lands less than 100 acres are excluded from the provisions of the code section. The code section authorizes the establishment of a Native American Heritage Commission with the responsibility to identify and make recommendations regarding Native American sacred sites.

4.14.2.5 California Health and Safety Code Section 7050.5: Disturbance of Human Remains

Section 7050.5 of the California Health and Safety Code includes the following requirements:

Every person who knowingly mutilates or disinters, wantonly disturbs, or willfully removes any human remains in or from any location other than a dedicated cemetery without authority of law is guilty of a misdemeanor.

In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27491 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of any death, and the recommendations concerning the treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative. The coroner shall make his or her determination within two working days from the time the person responsible for the excavation, or his or her authorized representative, notifies the coroner of the discovery or recognition of the human remains.

If the coroner determines that the remains are not subject to his or her authority and if the coroner recognizes the human remains to be those of a Native American, or has reason to believe that they are those of a Native American, he or she shall contact the NAHC by telephone within 24 hours.

4.14.2.6 California Health and Safety Code Sections 8010 to 8011: California Native American Graves Protection and Repatriation Act

Sections 8010–8011 of the California Health and Safety Code establish a State repatriation policy that is consistent with and facilitates implementation of the federal NAGPRA. The policy requires that all California Indian human remains and cultural items be treated with dignity and respect and encourages voluntary disclosure and return of remains and cultural items by publicly funded agencies and museums in California. The policy provides for mechanisms to aid California Indian tribes, including non-federally recognized tribes, in filing repatriation claims and getting responses to those claims.

4.14.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to cultural resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.15 Chapter 19: Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Indian Tribes or individuals. The Secretary of the Interior, acting as the trustee, holds many assets in trust. Examples of objects that may be trust assets are lands, minerals, hunting and fishing rights, and water rights. Although most ITAs are on reservations, they may also be found off of reservations. The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to Indian Tribes or Indian individuals by treaties, statutes, and executive orders. These are sometimes further interpreted through court decisions and regulations.

4.16 Chapter 20: Land Use

4.16.1 Federal Plans, Policies, and Regulations

4.16.1.1 Farmland Protection Policy Act

The Farmland Protection Policy Act of 1981 (FPPA) is a federal regulation that is intended to minimize the impact of federal programs with respect to the conversion of farmland to nonagricultural uses. The FPPA ensures that, to the extent possible, federal programs are administered to be compatible with State, local, and private programs and policies to protect farmland. It is administered by the USDA, Natural Resources Conservation Service (NRCS).

4.16.1.2 Wetlands Reserve Program

The NRCS administers the Wetlands Reserve Program (WRP). The WRP was established by Congress in the 1990 Farm Bill and has been reauthorized in the 1996, 2002, and 2008 Farm Bills. There have been WRP easements in California since 1992. The WRP is a voluntary program that offers landowners the opportunity to protect, restore, and enhance wetlands on their property. Landowners who are enrolled in the program retain the title to the land and the right to control access and recreational use of that land.

The WRP offers three options:

- Permanent Easement: this is a conservation easement in perpetuity. The USDA pays 100 percent of the easement value and up to 100 percent of the restoration costs.
- 30-Year Easement: this easement expires after 30 years. USDA pays up to 75 percent of the easement value and up to 75 percent of the restoration costs.
- Restoration Cost-Share Agreement: this is a 10-year agreement to restore or enhance the wetland functions and values without placing an easement on the enrolled acres. USDA pays up to 75 percent of the restoration costs.

Enrollment of land in the WRP limits the activities that can occur on that land, including digging, dredging, filling, leveling, and the installation of structures on, under, or over the easement area (except if those structures are for undeveloped recreational use).

4.16.2 State Plans, Policies, and Regulations

4.16.2.1 Important Farmland Inventory System and Farmland Mapping and Monitoring Program

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program. Lands are classified using a system that combines technical soil ratings and current land use into the following categories: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built-up Land, Other Land, and Water. The definitions of these classifications are provided below.

Land Use Categories

- **Prime Farmland:** Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- **Farmland of Statewide Importance:** Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- **Unique Farmland:** Farmland of lesser quality soils used for the production of the State’s leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.
- **Farmland of Local Importance:** Land of importance to the local agricultural economy, as determined by each county’s board of supervisors and a local advisory committee. The county-specific Board of Supervisors has the authority to adopt or recommend changes to this category of farmland.
- **Grazing Land:** Land on which the existing vegetation is suited to the grazing of livestock. This category was developed in Cooperation with the California Cattlemen’s Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.
- **Urban/Built-Up Land:** Land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.
- **Other Land:** Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and

waterbodies smaller than forty acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

- **Water:** Perennial water bodies with an extent of at least 40 acres.

4.16.2.2 California Land Conservation Act of 1965 (Williamson Act)

Preservation of farmland in California is encouraged by the California Land Conservation Act of 1965, more commonly known as the “Williamson Act” (Gov. Code §51250 et seq.). The Williamson Act enables local governments to form contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. A landowner signs a contract with the County in which the land is located, voluntarily restricting land to agricultural and open space uses.

Some open space, defined by Government Code §51201 is generally eligible to be included as a compatible (not primary) use:

- Wildlife habitat areas, designated by the Board or Council in consultation with CDFG
- Some managed wetland areas, tidal submerged areas, and salt evaporation ponds
- Land supporting recreational use and open to the public, in its natural or agricultural state
- Land in scenic highway corridors
- Land enrolled in the federal Conservation Reserve Program or Conservation Reserve Enhancement Program are Open Space Uses

In return, landowners receive substantially reduced property tax assessments; assessments that are based upon generated income (i.e., farming and open space uses) as opposed to potential market value of the property. Local governments received a partial subvention (i.e., subsidy) of foregone property tax revenues from the State via the Open Space Subvention Act of 1972 (Government Code §16140, et seq.) through 2009. These payments have been suspended in more recent years due to revenue shortfalls.

The contract is renewed automatically annually, continuing indefinitely unless the owner or local government files for non-renewal. The minimum initial contract term is 10 years. Pursuant to the non-renewal process, the remaining contract term (nine years in the case of an original term of 10 years) is allowed to lapse, with the contract null and void at the end of the term. Property tax rates gradually increase during the nonrenewal period, until they reach normal (i.e., non-restricted) levels upon termination of the contract.

Pursuant to a set of specifically defined circumstances, a contract may be cancelled by the landowner without completing the process of term nonrenewal (Government Code §51281). Contract cancellation involves a comprehensive review and approval process, and the payment of a fee by the landowner equal to 12.5 percent of the full market value of the property in question. Landowners may petition a County Board of Supervisors or City Council for a Williamson Act contract cancellation. The County or City is required to send a copy of the petition to the Department of Conservation as a separate submittal from any CEQA document.

There are five sections pursuant to the Williamson Act statute that a landowner may petition a Board of Supervisors or City Council for a full or partial cancellation:

- §51282(b) Cancellation is Consistent with the Williamson Act
- §51282(c) Cancellation is in the Public interest
- §51282.3 Cancellation for Specified Alternate Use of the Land

- §51282.5 Cancellation of Land Zoned as Timberland Production
- §51297 Cancellation of Farmland Security Zone Contract

Local activities, such as eminent domain or city annexation, also result in the termination of Williamson Act contracts.

In 1998, the provisions of the Williamson Act were expanded by SB 1182 to strengthen agricultural land preservation incentives. The 1998 changes provided a 35 percent property tax discount to the Williamson Act valuation or Proposition 13 valuation, whichever is lower, and other incentives for farmland owners willing to maintain their land in agricultural land use for 20 years. This latter program creates Farmland Security Zones (also known as the “Super Williamson Act”) within agricultural preserves. Land enrolled under a Farmland Security Zone contract is restricted to agricultural and open spaces uses for a minimum initial contract term of 20 years. Land within a Farmland Security Zone cannot be annexed into cities, and school districts are prohibited from acquiring Farmland Security Zone lands for school facilities. Cancellations of Farmland Security Zone contracts are more expensive and difficult than Williamson Act contracts.

4.16.2.3 California State Planning and Zoning Laws

California Government Code §65300 et seq. establishes the obligation of cities and counties to adopt and implement General Plans. A city or county General Plan is a comprehensive, long-term, and general document that describes plans for the physical development of a city or county and any land outside its boundaries[27] that, in the city’s or county’s judgment, bears relation to its planning. The General Plan addresses a broad range of topics, including seven mandatory elements: land use, circulation, housing, conservation, open space, noise, and safety. In addressing these and other topics, the General Plan identifies the goals, objectives, policies, principles, standards, and plan proposals that support the city’s or county’s vision for the area. Although the General Plan serves as a blueprint for future development and identifies the overall vision for the applicable planning area, it remains general enough to allow for flexibility in the approach taken to achieve its goals.

California Government Code §65800 et seq. establishes that zoning ordinances, which are laws that define allowable land uses in a specific district, are required to be consistent with the General Plan and any applicable Specific Plan. Zoning codes implement the policies and provisions of the General Plans, identify permitted uses in each zone, regulate the use of land and the general design of structures, and establish minimum regulations and standards for developing land in each jurisdiction. When amendments to a General Plan are made, corresponding changes in the zoning codes may be required to ensure that the land uses designated in the General Plan also would be allowable by the zoning code.

4.16.3 Regional and Local Plans, Policies, and Regulations

4.16.3.1 Tehama County General Plan

The 2009 Tehama County General Plan includes countywide goals that it uses as a basis for evaluating development proposals and other land-use related activities within Tehama County. The General Plan includes policies and implementation measures that support its goals. The County has also developed

Individual Planning Area policies. The countywide and Central I-5 Corridor Planning Area goals are listed below.

Countywide Policies

- **Goal LU-1:** To plan development within the County in a manner which will provide opportunities for current and future residents to enjoy rural, community oriented living environments that are similar to those currently found in the County. Encourage higher densities, where appropriate, and promote in-fill development to discourage agricultural land conversion demands.
- **Goal LU-2:** To manage development and ensure that an individual(s) action(s) do not adversely impact the health, safety, and welfare of the County's citizens.
- **Goal LU-3:** To promote a development pattern which, whenever possible, maximizes the use of existing infrastructure prior to the construction of new infrastructure. Develop a land use pattern which, to the maximum extent feasible, minimizes the expenditure of public funds for infrastructure construction and maintenance.
- **Goal LU-4:** To designate lands for commercial and industrial development that are appropriate for these purposes and allows opportunities for business and industrial firms. Encourage compact development contiguous to existing urban centers, discourage linear and leapfrog development patterns.
- **Goal LU-5:** To promote a development pattern that will accommodate growth, consistent with other stated goals and for the growth projected for the planning period (2008 to 2028).
- **Goal LU-6:** To govern new development with subdivision, zoning, and other regulations that explicitly define government and private sector responsibilities and expectations with regard to an acceptable balance between public facility and service costs.
- **Goal LU-7:** To accommodate growth in a manner that preserves the predominate rural lifestyle and unique qualities that make the County an attractive place to live and that recognizes that a rural lifestyle does not always necessitate the provision of the full complement of services normally found in urban communities.
- **Goal LU-8:** To develop land use patterns which minimize travel to jobs and services.
- **Goal LU-9:** To accommodate cellular tower facilities while requiring siting provisions that protects the visual quality and character of the County.
- **Goal LU-10:** To promote development patterns that recognize the need to preserve water resources, consistent with other stated goals.

Central I-5 Planning Area Policies

- **Policy CI-5.1:** The development pattern shall recognize the predominantly agricultural land use of the planning area.
- **Policy CI-5.2:** Population growth shall be accommodated primarily in the Los Molinos area by a development pattern transitioning from higher densities in the developed portion of Los Molinos to lower densities moving outward to the surrounding rural areas.

- **Policy Cl-5.3:** The rural service center of Proberta and Gerber shall accommodate growth consistent with their agricultural support function and in a manner that preserves the agricultural value of lands surrounding these communities.
- **Policy Cl-5.4:** The County recognizes the special district service providers and will work with the districts to incorporate policies during the project review process.
- **Policy Cl-5.5:** The future development pattern shall recognize the existing rural residential small lot development in the vicinity of Bryne Avenue, Clement Avenue, and the Sacramento River.

Tehama County General Plan Land Use and Zoning Designations

The intent of the General Industrial land use classification is to provide for industrial land uses, including light and heavy manufacturing, industrial parks, support wholesale energy production, related office uses, and industrial uses of similar character. This designation allows for non-industrial firms that provide materials and services related to industrial uses. Additional non-industrial uses may be permitted on an interim basis with conditions that provide for reversion to industrial uses. Examples of uses include: light to heavy manufacturing, fabrication, storage and warehousing, processing of goods and resources, energy facilities, equipment sales and storage yards, business and office parks and other such uses, which because of their operations, may create noise, light or glare, dust, or odor that are not compatible with residential or service and retail commercial uses. Non-accessory residential uses shall be strongly discouraged.

The Tehama County zoning designation that is compatible with the General Industrial land use designation is the General Industrial District (M-2). Chapter 17-36 – M-2 General Industrial District, of the Tehama County, California, Code of Ordinances, Title 17-Zoning, indicates that the purpose of the M-2 General Industrial District classification is to provide opportunities for heavy industrial land uses and support facilities. This District is consistent with the General Industry category of the Development Pattern and Community Organization Element of the County General Plan.

Uses permitted in an M-2 District shall be as follows:

- Uses permitted in the M-1 District[28], except that dwellings, mobile homes, as defined in this title, and hotels may be permitted only upon the securing of a use permit
- The following specific uses, which shall be permitted only in M-2 Districts:
  - Wholesale lumber yards, lumber bills
  - Pottery kilns and ceramic works of heavy industrial types
  - Concrete batching plants
  - Blacksmith shops, casting foundries

[28] Uses permitted in the M-1 District include (A) uses permitted in C-3 District (i.e., General Commercial District classified facilities) except that dwellings, mobile homes, recreational vehicle parks, mobile home parks, and hotels may be permitted only upon the securing of a use permit; (B) The following uses of land and buildings, which shall be permitted in M-1 Districts: (1) Assembly and storage of goods, materials, liquids and flammable or explosive matter or materials which create dust, odor or fumes, including the following similar uses: (**a)** Wholesale and storage warehouses; (b) Feedyards and fuel yards; (2) Manufacturing, processing, fabricating, refining, repairing, packaging or treatment of goods, material or produce by electric power, oil or gas, except operations involving fish fats and oils, bones and meat products, or similar substances commonly recognized as creating offensive conditions in the handling thereof, including the following and similar uses: (a) Dyeing and dry-cleaning plants, (b) Rug cleaning plants, (c) Laundries, (d) Veterinary hospitals, (e) Construction and material yards, except gravel, rock and cement material yards, (f) Retail lumber yards; (C) The following when conducted within a building or enclosed within a solid wall or fence of a type approved by the planning commission and not less than six feet in height: (1) Body and fender repair shops, auto painting shops, (2) Cooperage and bottling works, (3) Sheet metal shops, welding shops, (4) Truck terminals; (D) Living quarters when accessory to the principal permitted use; (E) Mixed-use buildings.

- The following when enclosed with a solid wall or fence not less than six feet in height and of a type approved by the Planning Commission:
  - Building material storage yard, contractors storage yard
  - Junkyard
- Uses requiring Use Permits in an M-2 District shall be as follows: lawful uses not otherwise provided for in this chapter and not found to be similar to uses listed herein.

4.16.3.2 Glenn County General Plan

The 1993 Glenn County General Plan includes the following countywide goals that it uses as a basis for evaluating development proposals and other land-use related activities within Glenn County. The General Plan includes policies and implementation measures that support its goals. Provided below are the goals and policies that reflect Glenn County's approach to managing land use and agricultural land and timberland preservation.

Natural Resources

Agriculture/Soils: Goals and Policies

Goal: NRG-1 – Preservation of Agricultural: Goal Land

It shall be the policy of Glenn County to:

- **NRP-1:** Maintain agriculture as a primary extensive land use, not only in recognition of the economic importance of agriculture, but also in terms of agriculture's contribution to the preservation of open space and wildlife habitat.
- **NRP-2:** Support the concept that agriculture is a total, functioning system which will suffer when any part of it is subjected to regulation resulting in the decline of agricultural economics productivity, unmitigated land use conflicts, and/or excessive land fragmentation.
- **NRP-3:** Recognize the value of ricelands for waterfowl habitat, watershed management, and for groundwater recharge in an effort to preserve such lands and to maintain necessary water supplies in Glenn County.
- **NRP-5:** Continue participation in the Williamson Act: policy, and allow new lands devoted to commercial agriculture and located outside urban limit lines to enter the program, subject to the specific standards for inclusion contained in this General Plan.
- **NRP-8:** Assure that future land use decisions protect and enhance the agricultural economics industry while also protecting existing uses from potential incompatibilities.
- **NRP-9:** Encourage use of agricultural land preservation lands preservation tools such as incounty transfer of development rights, conservation easements, exclusive agricultural zoning and continuation of minimum parcel sizes.
- **NRP-11:** Monitor requests for subdivision of agricultural land preservationly developed and zoned parcels, located outside urban limit lines, in order to determine if present minimum parcel sizes are working effectively to discourage agricultural lands conversion.

- **NRP-12:** Review agricultural land conversion findings as described in NRP-11 with decision makers annually.
- **NRP-14:** Consult Important Farmland Maps and other sources of information on the relative value of agricultural lands when planning areas of growth, in order to direct growth and development toward lesser value agricultural lands.
- **NRP-15:** Recognize that, in order to realistically provide for the necessary diversity and growth required in the local economy, some lands presently committed to agriculture may be consumed by other development activities, and plan for and monitor such conversion to assure that it does not hinder or restrict existing agricultural operations. Priority shall be given to industries related to agriculture.
- **NRP-21:** Require notices of nonrenewal for Williamson Act lands as a condition of land division and boundary line changes, which result in parcel sizes below zoning minimums.

Goal: NRG-4 – Preservation, Maintenance and Restoration of Forestry Resources

It shall be the policy of Glenn County to:

- **NRP-63:** Preserve public and private timber lands and reserve them for that use, while at the same time encouraging compatible recreation and open space uses.

Community Development

Land Use/Growth: Goals and Policies

Goal: CDG-1 – Preservation of Agricultural Land

It shall be the policy of Glenn County to:

- **CDP-1:** Establish urban-rural interface areas within which all new development shall incorporate a buffer zone to separate the development from surrounding agricultural land. This requirement may be eliminated or modified if there are significant topographical differences, substantial vegetation, or existing physical barriers between urban and rural areas.
- **CDP-2:** Require that permanent well-defined buffer areas be provided as part of new nonagricultural development proposals located adjacent to agricultural land uses on Important Farmlands designated as prime, of statewide importance, unique, or of local importance. These buffer areas shall be dedicated in perpetuity, shall be of sufficient size to protect agriculture from the impacts of incompatible development and to mitigate the effects of agricultural operations on adjacent land uses, and shall be credited as open space.
- **CDP-10:** Encourage the preservation of agricultural lands, including those lands in production, and those which are potentially productive.
- **CDP-11:** Direct nonagricultural development to marginal agricultural lands, avoiding Important Farmlands, wherever feasible alternative sites have been identified.

Goal: CDG-3 – Appropriate Distribution and Regulation of Land Uses

It shall be the policy of Glenn County to:

- **CDP-20:** Assure that adequate provision is made in this General Plan for all types of uses and establish coherent land use patterns.
- **CDP-31:** Encourage commercial and industrial development in areas where adequate facilities and services exist or where facilities and services can be made available, including areas within incorporated cities, planned communities and along the I-5 corridor. Adequate facilities and services shall include community water and sewer if located within an incorporated city or urban limit line. In other areas, adequacy of sewer and water service shall be as determined by local health standards/regulations.

Glenn County Zoning Designations

AP – Agricultural Preserve Zone

The Agricultural Preserve Zone is to be applied to lands which are covered by a California Land Conservation Act (Williamson Act) contract with the county for the following purposes:

- To preserve the maximum amount of the limited supply of agricultural land which is necessary in the conservation of the county's economic resources and vital for a healthy agricultural economy of the county
- To protect the general welfare of the agricultural community for encroachments of unrelated agricultural uses which, by their nature, would be injurious to the physical and economic well-being of the agricultural community

The following uses and structures shall be permitted in the AP zone:

- One single-family residence for each parcel of land (refer to minimum residential construction standards)
- Second residence per each parcel of land (refer to minimum residential construction standards) providing that such residence may only be occupied by relatives of the owner or by employees who work on the property
- Accessory buildings such as garages, carports, greenhouses, gardening sheds, recreation rooms, storage of petroleum products for the use of persons residing on the property and any other structures that are customarily used in conjunction with and incidental to a principal use or structure
- Home occupations as defined in Chapter 15.780
- Growing and harvesting of fruit and nut trees, vines, vegetables, horticultural specialties and timber
- Growing and harvesting of field crops, grain and hay crops, and the growing of grass for pasture and grazing
- Livestock farming, including the raising, feeding, maintaining and breeding of horses, cattle, sheep, goats and similar livestock
- Operation of apiaries and dairies

- Curing, processing, packaging, packing, storage and shipping of agricultural products; however, those particular operations, uses and structures which create smoke, fumes, dust, odor and other hazards may be permitted only if a conditional use permit is first secured
- Accessory buildings or structures required for the storage of any crops, products, equipment or uses lawfully permitted or produced on the premises. Structures such as barns, stables, coops, tank houses, storage tanks, wind machines, windmills, silos and other farm buildings
- Game preserves and hunting clubs, private or public, but shall not include permanent facilities such as hotels, motels, restaurants, club houses
- Agricultural service establishments primarily engaged in performing agricultural animal husbandry services or horticultural services to farms
- Temporary landing of aircraft engaged in agricultural uses
- Dehydrators but not for the general public on a commercial basis
- Stands for the purpose of displaying and selling agricultural, floricultural or farming products which are grown or produced on the premises; provided, that there shall not be more than one stand per parcel of land. The stand shall be set back from the street or highway right-of-way a distance of at least twenty feet. Such stand must be of good frame construction
- Seasonal farmworker housing which meets the Seasonal Farmworker Housing Standards as set forth in Chapter 15.800 and approved for such use pursuant to Title 25 of the CCR. Seasonal farmworker housing shall also conform to such public health, building, and fire safety criteria as may be established by resolution or ordinance of the Board of Supervisors

The following uses and structures may be permitted in the AP Zone only if a conditional use permit has first been secured:

- Irrigation and flood control facilities, public utility and public service structures including electric transmission and distribution substations, gas regulator stations, communications equipment buildings, public service pumping stations and reservoirs over fifty acre-feet or over twenty-five feet high
- Agricultural labor camps
- Injection wells
- Confined animal facility
- Mining which meets the requirements of Government Code Sections 51238.1 or 51238.2

The following uses and structures may be permitted only if an administrative permit has first been secured:

- Natural gas wells
- Home occupation not in residential dwelling for parcels of at least 10 acres or more in size
- Agricultural Homestay Establishment

Site Area

- For prime land, the minimum area of any lot or parcel of land shall be thirty-six (36) acres or one quarter of one quarter section
- For nonprime land, the minimum area of any lot or parcel of land shall be one hundred forty-four (144) acres or one quarter section
- Variance for parcel size shall not be permitted
- The minimum area of any lot or parcel of land for each of the AP zones shall be as shown below:
  - AP-40 - Minimum Parcel Size 36 acres
  - AP-80 - Minimum Parcel Size 72 acres
  - AP-160 - Minimum Parcel Size 144 acres
- Non-contiguous parcels with a farmed area between 10 and 36 acres may be allowed if:
  - Parcel is in the same ownership as qualifying parcels but is not contiguous to the qualifying parcel, and
  - The contract contains a provision not allowing the non-contiguous parcel to be separated from the ownership of the qualifying parcels
  - The contract contains a provision not allowing construction of any residential use on the qualifying parcel

FA – Foothill Agricultural/Forestry Zone

This zoning classification is established for the following purposes:

- To provide areas for extensive agricultural activities
- To protect the timber and forest lands economically suitable for logging

The following uses and structures shall be permitted in the FA Zone:

- One single-family dwelling or mobile home for each one hundred sixty acres, private farm buildings, accessory buildings, and uses.
- Home occupations if a permit is secured pursuant to Chapter 15.780
- Growing and harvesting forest products
- Logging and sawmill operations and accessory buildings and uses
- Growing and harvesting of any agricultural crop or product
- The use of implements of husbandry, including aircraft when used in the growing of crops or raising of animals, except as may be regulated by other laws or regulations
- Game preserves and hunting clubs, private or public, but shall not include permanent facilities such as hotels, motels, restaurants, club houses
- Agricultural service establishments primarily engaged in performing agricultural animal husbandry services or horticultural services to farmers

- Temporary landing of aircraft engaged in agricultural uses
- Livestock farming, including the raising, feeding, maintaining and breeding of horses, cattle, sheep, goats and similar livestock
- Accessory buildings or structures required for the storage of any crops, products, equipment or uses lawfully permitted or produced on the premises
- The keeping of fowl and animals shall conform to all other provisions of law governing same. No pen, coop, stable, barn or corral used for fowl and animals shall be kept or maintained within fifty feet of any dwelling or other building used for human habitation, or within one hundred feet of the front lot line of the lot upon which it is located, or within twenty-five feet of the street side of a corner lot, or within one hundred feet of any parcel of land used for a public park, school or similar institution
- Stands for the purpose of displaying and selling agricultural, floricultural or farming products which are grown or produced on the premises, provided that there shall be not more than one stand per lot or parcel of land. The ground coverage of the stand shall not exceed three hundred square feet and it shall be set back from the street or highway right-of-way a distance of at least twenty feet. Such stand must be of good frame construction
- Windmills, tank houses, buildings or shelters for farm equipment and machinery, water wells, water reservoirs and storage tanks

The following uses and structures may be permitted in the FA Zone only if a conditional use permit has first been secured:

- Commercial storage and handling of agricultural chemicals
- Farm labor camps and structures for transient labor
- Commercial hog and pig farming
- Animal sales yards
- Commercial stables, riding academies
- Public and private nonprofit nursery schools, elementary schools, junior high schools, high schools, and colleges
- Churches, public playgrounds, and parks
- Sales and services to farmers or farm-related activities
- Government buildings and properties
- Kennels, animal hospitals, and veterinarian's offices
- Public utility buildings and public service or utility uses (transmission and distribution lines excepted), including but not limited to reservoirs, storage tanks, pumping stations, telephone exchanges, power stations, transformer stations, service yards, and parking lots
- Cemeteries, crematories, and mausoleums

- Commercial storage (storage for resale) of inflammable fluid or gas fuels in a quantity greater than five hundred gallons in any container less than two and one-half feet below the surface of the ground
- New confined animal facilities
- Confined animal facility expansion

The following uses and structures may be permitted only if an administrative permit has first been secured:

- Second residence per each parcel of land
- Natural gas wells
- Agricultural Homestay Establishment

The minimum area of any lot or parcel of land in the FA Zone shall be one hundred forty-four (144) acres.

4.16.3.3 Colusa County General Plan

The 2012 Colusa County General Plan includes the following countywide goals, objectives, and policies that it uses as a basis for evaluating development proposals and other land-use related activities within the County. Provided below are the goals, objectives, and policies that reflect Colusa County's approach to managing land use, agricultural land and timberland preservation, and open space uses.

Land Use Element

The Land Use Element provides for a development and resource conservation pattern that preserves and fosters the rural and agricultural character of Colusa County while allowing for economic development.

Goal LU-1: Maintain the Efficient and Harmonious use of Land in the County, Promoting a well Organized and Orderly Development Pattern, Avoiding Random, Haphazard Growth, Protecting Public Health and Safety, and Accommodating the Orderly and Sustainable Growth of Employment and Population

Objective LU-1A: Provide a Balanced Mix of Land Uses that Reflect the Needs of the County Residents and Businesses

- **Policy LU 1-2:** Ensure that the County designates a supply of developable industrial, commercial, and residential land sufficient to meet projected growth and economic needs over the planning period.
- **Policy LU 1-7:** The Land Use Map may be amended from time to time to ensure that there is an adequate supply of industrial, commercial, public service, residential, and other lands to serve the County's economic needs. However, agricultural and open space lands shall not be re-designated or developed for urban or residential uses unless:
  - The proposed use is necessary for the economic, agricultural, and social well-being of the County.
  - Residential uses are located away from areas of excessive noise, smoke, or dust, especially in those areas adjoining freeways or industrial uses.
  - The proposed use will not conflict with existing or anticipated uses in the vicinity.

- **Policy LU 1-27:** Participate in countywide, regional and other multi-agency planning efforts related to agriculture, water supply, tourism, open space, air quality, housing, green infrastructure, recreation, habitat conservation, energy, emergency preparedness and flood protection to ensure that the needs of the County's residents and businesses are not overlooked.

Goal LU-2: Maintain Agriculture as the Paramount Land Use in the County and Ensure Land Use and Planning Decisions Support a Strong Agricultural Economy

Objective LU-2A: Conserve and Protect Agricultural Land through a Variety of Strategies, including General Planning, Zoning, Taxation, and Easements

- **Policy LU 2-1:** Agriculture, upland, and resource conservation are the primary land use designations to be used outside of the communities and any adjacent Urban Reserve Areas.
- **Policy LU 2-2:** Ensure that future development and land use decisions protect the integrity of agriculture and do not in any way create a hardship for the county's farmers.
- **Policy LU 2-3:** Ensure that lands presently in agricultural uses that do not adjoin existing communities continue to be designated for agricultural uses and are protected through the county's land use regulations.
- **Policy LU 2-4:** Manage agricultural parcels of less than 20 acres, including antiquated subdivisions, to improve compatibility with surrounding agricultural uses, including:
  - Minimizing the impact of residential development near farms.
  - Encouraging lot mergers to achieve larger parcel sizes.
  - Locating dwelling units and structures near roads and in a way that minimizes interruption or fragmentation of agricultural lands.

Objective LU-2A: Only Permit Development on Agricultural Land that will Not Interfere with Viable Agricultural Operations

Agricultural and Upland (Agriculture General, Agriculture Transition, and Agriculture Upland) Policies

- **Policy LU 2-5:** Require lands designated Agriculture General, Agriculture Transition, or Agriculture Upland to remain designated for agricultural use, including businesses or uses that directly support County agricultural activities, for at least the duration of the planning period, with the exception of lands redesignated consistent with the requirements of Policy LU 1-7.
- **Policy LU 2-6:** Discourage the division of land in agricultural areas if the division is not for the purpose of farming or other agricultural activities or if the division precludes the future opportunity to farm the land.

Goal LU-3: Ensure that Future Development Achieves the County's Goals of Agricultural Conservation, Rural Character, Growth Focused Around Existing Communities and Uses Sustainable Practices through Application of Development Requirements

- **Policy LU 3-4:** Require transitional uses or a buffer between residential and industrial uses, residential and general agriculture uses, and residential and agriculture upland uses.

Goal LU-4: Provide Clear Land Use Objectives and Standards to Address the Unique Needs and Conditions Associated with the Proposed Sites Reservoir

Objective LU-4A: Provide for Orderly, Well-planned, and Compatible Growth associated with the Proposed Sites Reservoir and Surrounding Area

- **Policy LU 4-1:** Support the creation of Sites Reservoir.
- **Policy LU 4-2:** Participate in State and regional planning efforts related to the creation of Sites Reservoir to the greatest extent feasible.
- **Policy LU 4-3:** Ensure that future land use decisions regarding Sites Reservoir and the surrounding area recognize the needs of the County and existing property owners to address adequate access for existing landowners and persons who travel beyond the area, noise, habitat for displaced species, and recreation and tourist opportunities that are compatible with the surrounding region.
- **Policy LU 4-4:** Support the efforts of the Sites Reservoir Joint Powers Authority, with particular emphasis on landowner relocation assistance and ensuring financial compensation for landowners adversely impacted by the creation of Sites Reservoir.
- **Policy LU 4-5:** Future land use and zoning designations in the Sites Reservoir Planning Area should emphasize natural resource and wildlife habitat protection, recreational opportunities, open space preservation, and limited commercial development to support recreation and tourism. Year-round housing in the vicinity of Sites Reservoir should be discouraged.

Action LU 4-A: When the final boundaries for the proposed Sites Reservoir are determined and approved by the California Department of Water Resources, develop a Sites Area Plan to guide land uses in the Sites Reservoir Area. The plan shall include policies and actions to promote the economic and social viability of the area and shall designate a variety of land uses. Land uses in the plan shall include provisions for active and passive recreation, limited commercial uses oriented toward recreation and tourism, viewing points of the main scenic areas of the reservoir and any bridges, and seasonal housing and campgrounds in the areas immediately adjacent the reservoir. Additionally, the plan shall identify agricultural land to accommodate the needs of existing landowners and farmers and habitat land for displaced species. Access, noise, water, wastewater, and emergency services shall be considered in the designation of land uses.

Action LU 4-B: Actively participate in the Sites Project Joint Powers Authority, and any other state and regional entities formed to plan and develop the Sites Reservoir. Ensure that the County's needs for a range of land uses, adequate and convenient access to existing parcels, habitat for plants, wildlife, and special-status species, adequate and convenient access to communities (Lodoga, Stonyford, etc.), and recreation and tourist opportunities are addressed and that measures to promote the economic and social viability of the area and to reduce adverse noise, traffic, and other adverse impacts are identified and implemented.

Agricultural Element

The Agriculture Element contains goals, objectives, policies and action items geared towards the protection of agricultural lands, the expansion of agricultural operations, and the reduction of conflicts between agricultural and non-agricultural land uses.

Goal AG-1: Preserve and Protect Agricultural Land

Objective AG 1-A: Recognize that Agricultural Land is the County's Greatest Natural Asset and Take Appropriate Measures to Restrict the Conversion of Agricultural Lands to Non-Agricultural Use

- **Policy AG 1-1:** The following General Plan land use designations are considered agricultural lands: Agricultural General (AG), Agricultural Upland (AU), and Agricultural Transition (AT).
- **Policy AG 1-2:** Lands designated for agricultural uses shall remain designated for agriculture and not be rezoned or redesignated to an urban use unless all of the following criteria are met:
  - The lot(s) for which conversion is requested is adjacent to agriculture or agricultural support uses (e.g. receiving plants, hulling plants, warehousing, trucking, distribution, and other related activities.) on no more than two sides of the lot(s) or less than 50 percent of the perimeter of the lot(s) proposed for conversion.
  - The conversion will not be detrimental to existing agricultural operations.
  - The conversion land is within 500 feet of existing urban infrastructure (e.g., water supply lines and sewer lines) and conversion will constitute a logical contiguous extension of a designated urban area.
  - The lot(s) proposed for conversion include a buffer at the agricultural/urban transition zone to protect future users of the conversion lands from nuisances associated with typical agricultural practices.
  - No feasible alternative location (e.g., non-agricultural lands or less productive agricultural lands) exists.
  - The use would not have a significant adverse effect on existing or potential agricultural activities on surrounding agricultural lands.
- **Policy AG 1-3:** Land divisions that separate a residence or an agricultural processing facility from the agricultural land shall be prohibited, unless the lot split meets the minimum lot size requirement of the zoning district.
- **Policy AG 1-4:** Maintain agricultural parcel sizes that are large enough to sustain agricultural activities. The following minimum lot sizes shall apply to agricultural lands: Agricultural General- 40 acres, Agricultural Upland-80 acres, and Agricultural Transition -10 acres.
- **Policy AG 1-5:** Encourage lot mergers to meet minimum parcel size standards.
- **Policy AG 1-6:** Residential development on agricultural lands shall be limited to housing for family members and agricultural employee housing.

Goal AG-2: Maintain and Enhance Agriculture as the County's Most Critical Land Use, Economic Sector, and Resource

Objective AG 2-B: Allow Limited Recreation and Resource Production Uses on Agricultural Lands While Ensuring that Such Uses Do Not Adversely Affect Agricultural Activities

- **Policy AG 2-2:** Visitor-serving uses that support and are incidental to agricultural production, such as tasting rooms, including sales and promotion of products grown or processed in the County, educational activities and tours, incidental sales of items related to local area agricultural products, promotional events, and farm homestays, which allow visitors to visit a farm in the form of a vacation, that support and are secondary and incidental to local agricultural production, shall be allowed on agricultural lands provided the following findings are made:
  - The use promotes and markets only agricultural products grown or processed in the local area.
  - The use is compatible with and secondary and incidental to agricultural production activities in the area.
  - The use will not require the extension of sewer and water service.
  - The use is compatible with existing uses in the area.
  - The use will not adversely affect agricultural production in the area.
  - The use will not result in significant adverse traffic or air quality impacts.
  - The use will not be detrimental to the rural character of the area.
- **Policy AG 2-3:** Low-intensity recreational uses may be permitted on agricultural lands as long as they do not interfere with the principal use of the land for agricultural purposes. Examples include hunting, fishing, target shooting, horseback riding, hiking and exhibitions of working farms or ranches.

Objective AG 2-C: Preserve and Protect Water, Soil, and Natural Resources Necessary for Agricultural Operations

- **Policy AG 2-8:** Support and promote water development projects which provide additional sources of water for agricultural uses.
- **Policy AG 2-9:** Support the procurement of expanded and additional water rights which provide for contractual supply reliability for agricultural use.

Open Space and Recreation Element

Recreation is an important concern of County residents, and park facilities and recreational opportunities cannot exist without open space. This element addresses parks and recreation issues, goals, objectives, and policies.

Goal OSR-1: Preserve and Protect the Natural Resources and Scenic Beauty of the County

Objective OSR 1-A: Provide a Diverse and Accessible Range of Open Space Lands

- **Policy OSR 1-9**: Maintain open space for future water and drainage projects.

Objective OSR 1-E: Retain and Preserve Expansive Open spaces, Uninterrupted by Urban Development, both in the Valley Floor and in Upland Valleys

- **Policy OSR 1-23:** Ensure that open space buffers such as greenbelts, drainage features, parks, or other improved and maintained features are provided by new development projects, where appropriate, between new urban development and sensitive open space uses, such as agriculture and wildlife habitat. Buffers shall be adequately sized to reduce potential land use conflicts between adjacent uses.

Goal OSR-2: Increase Opportunities for Recreational Activities in Open Space

Objective OSR 2-A: Ensure Adequate and Increased Public Access is Available to Open Space Recreation Areas

- **Policy OSR 2-5**: Public access to the water and shoreline areas of lakes, reservoirs, rivers and streams, should be provided where appropriate.

Objective OSR 2-B: Increase Opportunities for County Residents and Visitors to Engage in a Broad Variety of Outdoor Recreation Activities

- **Policy OSR 2-13:** Encourage recreational uses that emphasize use of the waterways in locations directly on the Sacramento River, East Park Reservoir, and the proposed Sites Reservoir. Examples include fishing, canoeing, boating, and nature observation. With the exception of boat launches and docks, more active uses, such as parking, restrooms, and picnic areas, shall be located in areas away from the river and sensitive riparian habitat.
- **Policy OSR 2-14:** Encourage recreational uses that emphasize a range of outdoor activities, such as hiking, drive-in camping, hike-in camping, picnics, off-highway vehicle use, and nature observation, at the Mendocino National Forest, East Park Reservoir, proposed Sites Reservoir, Sacramento River, and other outdoor recreation areas.
- **Policy OSR 2-15:** Support the location and creation of Sites Reservoir in Colusa County (See Policies LU 4-1 through 4-5).
- **Policy OSR 2-16:** Require future water development projects, including reservoirs, marinas, and water-front developments, to include provisions for public access to the water and shoreline areas to the greatest extent feasible, without compromising private property rights.

Colusa County General Plan Land Use and Zoning Designations

The Agriculture General (AG)[29] land use designation identifies areas to be retained for agriculture and/or uses that are complementary to existing or nearby agricultural uses. This designation includes lands under agricultural preservation and/or conservation contracts and easements; land having present or future potential for agricultural production, and contiguous or intermixed smaller parcels on which non-compatible uses could jeopardize the long-term agricultural use of nearby agricultural lands. Lands designated Agriculture General are planned to be preserved for agricultural uses and the intent of the

[29] Agriculture Preserve (A-P) and Exclusive Agriculture (E-A) zoning districts are compatible with the Agriculture General land use designation.

designation is to preserve such lands for existing and future agricultural use and protect these lands from the pressures of development.

The Colusa County zoning classifications are presented below.

A-P – Agriculture Preserve Zone

The Agriculture Preserve or A-P Zone is intended to be applied in areas where agriculture is the natural and desirable primary land use and where the protection of agriculture from the encroachment of incompatible uses is essential to the general welfare.

- Principal Permitted Uses:
  - All general agricultural uses, including animal husbandry and all structures appurtenant to principal agricultural uses, main single-family dwelling for the landowner or the primary tenant of the property, nurseries and greenhouses, private farm airports, guest houses not rented or otherwise conducted as a business
- Uses Permitted with a Use Permit:
  - Single-family dwelling units for immediate relatives of the property owner, caretakers or farm labor housing
  - Commercial animal raising or farms
  - Agriculture auction and sales yards or collection yards
  - Agricultural products processing plants
  - Establishments for sale, rental or repair of farm equipment and supplies
  - Animal hospitals and kennels
  - Farm labor camps
  - Airports for commercial farm services
  - Residential mobile homes
  - Exploratory drilling and production of fossil fuels and geothermal power
  - Recreational uses such as gun and hunt clubs, boat landings, and resorts
- Other Regulations:
  - Minimum parcel size: eighty acres
  - Minimum parcel width: one hundred feet
  - Minimum parcel depth: two hundred feet
  - Minimum yards: front, twenty-five feet; side, ten feet; rear, twenty feet
  - Maximum building height (residential): thirty feet
  - Development standards as set forth in Article 8

E-A – Exclusive Agriculture Zone

The Exclusive Agriculture or E-A zoning classification is intended to be applied in agricultural lands with a General Plan land use designation of AG. The E-A Zone is to be applied to those areas where agricultural activities are the appropriate and desirable primary land use. The E-A Zone is to be applied to those areas where the protection of agriculture from the encroachment of incompatible uses is essential to the general welfare of the county citizens. The E-A Zone is to help maintain, protect, enhance, and propagate the county's agricultural resources. The E-A Zone is to protect and maintain a viable agricultural economy in the county. The E-A Zone is to protect agriculturalists from environmental impacts and pressures as they relate to groundwater, nonagriculture traffic, and encroachment from residential development resulting in common agriculture/residential conflicts related to noise, odors, spraying, vandalism, trespassing, and predation from wildlife habitating on nonmaintained adjacent ten-acre sized lots.

- Principal Permitted Uses:
  - All general agricultural uses, including farming, dairying, and pasturage
  - Horticulture, floriculture, aquaculture, and viticulture; the growing and harvesting of forestry products
  - Animal husbandry, and general keeping of animals, subject to the animal maintenance requirements of section 6.04
  - Nurseries and greenhouses
  - Private farm airports
  - Housing allowed as a permitted use as it is an appurtenant use to principal agricultural uses:
    - Primary residence, one single-family dwelling or modular home per parcel, for the landowner or primary tenant of the property whose principal income is derived from those agricultural activities upon which the house is located and other agricultural lands
    - Housing facilities (including mobile/modular homes) to accommodate up to twelve agricultural workers and their families employed by the owner or operator of premises or owners or operators of other agricultural lands
  - Buildings and uses accessory to the permitted uses, barns and other storage or shop buildings; those structures normally associated with a single-family residence use and in conjunction with or incidental to the residential use, including, but not limited to, a garage, workshop, shed, garden, private swimming pool, private tennis court, gazebo, spa, and other similar structures/uses
- Uses Permitted with a Use Permit:
  - Guest houses not rented or otherwise conducted as a business
  - Agriculture auction and sales or collection yards
  - Agriculture products processing plants
  - Agriculture chemicals manufacture, distribution, and storage
  - Establishments for sale, rental or repair of farm equipment and supplies
  - Establishments for repair of natural gas equipment and associated accessories associated with natural gas wells
  - Public and quasi-public uses

- Public tasting rooms in conjunction with a winery; provided, that such tasting room be considered accessory to the on-site winery
- Public or riding stables and academies
- Outdoor commercial recreational facilities on sites not less than five acres
- Kennels and animal hospitals
- Airports for commercial farm services
- Second dwelling unit, either a single-family dwelling unit or modular home for immediate relatives of property owner, or caretaker
- Oil and natural gas wells
- The erection, construction, alteration or maintenance of gas, electric, water, or communication transmission facilities
- Exploratory drilling and production of fossil fuels, geothermal power, and natural gas
- Recreational uses such as seasonal hunting and fishing camps, duck clubs with accessory structures, boat landings with accessory structures, and resorts

- Other Regulations:
  - Minimum parcel size: forty acres, including the existing and proposed rights-of-way of the county road or roads on which said parcel has frontage on the front, rear or side
  - Minimum parcel width: one hundred feet
  - Minimum parcel depth: two hundred feet
  - Minimum yards: front – twenty-five feet; side – twenty-five feet; rear – twenty-five feet
  - Maximum building height (residential): thirty feet
  - Development standards as set forth in Article 8. (Ordinance Number 722, §1.)

M – Industrial Zone

The industrial or M Zone is intended to apply to areas devoted to light manufacturing, heavy commercial uses, large administrative facilities and normal operations of industries, subject only to such regulations as are needed to control congestion and protect surrounding areas from significant environmental impacts.

- Principal Permitted Uses:
  - Food processing plants, fabrication or processing of metal, wood, fiber, plastic or pottery products
  - Administrative, business and professional offices, editorial, publishing and bookbinding
  - Manufacturing of electrical and electronic equipment; research and development laboratories
  - Warehouses, enclosed storage and distribution facilities

- Automotive and farm equipment sales, service, repair and rental facilities; farm and building supplies; truck terminals
- Industrial manufacturing uses

- Uses Permitted with a Use Permit:
  - Churches and other private institutions
  - Private recreation facilities
  - Commercial animal farms, animal hospitals and kennels
  - Animal products processing plants
  - Junk yards, garbage dumps, sewage plants
  - Smelting or reduction of metallic ores
  - Manufacturing, refining and storage by manufacturers or wholesalers or petroleum or petroleum products, acids, cement, explosives, fireworks, gas, glue, gypsum, and inflammable fluids or gasses
  - Drilling for oil or gas, or commercial excavation of sand, rock, gravel, or other natural materials
  - Manufacture of concrete, pottery, or asphaltic paving products
  - Energy production plants
- Other Regulations:
  - Minimum lot size, width, depth, and minimum yards: none
  - Maximum building height: fifty feet
  - Development standards as set forth in Article 8

F-W – Floodway Zone

The Floodway or F-W Zone is intended to be applied to lands which lie within stream or tidal channels and to adjacent areas which are periodically inundated, or which will be inundated by a “design flood.”

The regulations set forth in this section are intended to provide for the reasonably unrestricted passage of a “design flood” and to provide reasonable measures for the protection of life and property in floodway areas.

- Principal Permitted Uses:
  - General agriculture, but not including building or structures
  - Recreational uses on open land, including public and private parks and golf courses
- Uses Permitted with a Use Permit:
  - Private recreation facilities
  - Boat docks and launching facilities
  - Water, sewer, roadway, bridge, and other such facilities necessary for public health and safety

  - Minor or temporary structures incidental to agricultural or recreational uses, which will not impede flood flow and are of flood-proof design
  - Excavation of natural materials or construction of earthworks or water flow control devices
- Other Regulations:
  - None, except conditions in use permits
  - Development standards as set forth in Article 8

4.17 Chapter 21: Recreation Resources

4.17.1 Federal Plans, Policies, and Regulations

4.17.1.1 Management Guide for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area

The purpose of the 1996 Shasta-Trinity National Recreation Area (NRA) management guide is to integrate past decisions that remain pertinent for managing the Shasta and Trinity units of the NRA with standards, guidelines, and management prescriptions incorporated from the April 1995 Shasta-Trinity National Forest Land and Resource Management Plan (LRMP). The LRMP establishes integrated land management direction, including time frames for implementing, monitoring, and evaluating projects, activities, programs, and budgeting in the Shasta-Trinity National Forest for a period of 10 to 15 years. The NRA management guide provides an analysis of direction from the LRMP, a summary of existing conditions, a description of desired future conditions, and a strategy of management recommendations, opportunities, and mitigation measures that will be used to implement the direction in the LRMP and achieve the desired future conditions.

4.17.1.2 Federal Water Project Recreation Act of 1965

This statute declares that recreation, fish and wildlife enhancement be given full consideration as purposes of federal water projects if non-federal public bodies agree: 1) to bear 50 percent of the cost of recreation enhancement and 25 percent of the cost of fish and wildlife enhancement, 2) to administer project lands and water bodies for these purposes, and 3) to bear all operation, maintenance, and replacement costs. This cost sharing is not required on federal lands under federal programs for fish and wildlife conservation.

4.17.1.3 Rehabilitation Act of 1973

This federal act extended and revised authorization of grants to states for vocational rehabilitation. One of the purposes of the act is to evaluate architectural and transportation barriers to handicapped individuals, develop new approaches, enforce statutory standards and requirements regarding barrier free construction of public facilities.

4.17.1.4 Architectural Barriers Act of 1968

The Architectural Barriers Act requires access to facilities designed, built, altered, or leased with federal funds. The Act is enforced by the Department of Defense, the Department of Housing and Urban Development, the General Services Administration, and the U.S. Postal Service to ensure, whenever possible, that physically handicapped persons will have ready access to, and use of, such buildings

4.17.1.5 Americans with Disabilities Act of 1990, as Amended

Public facilities must comply with the Americans with Disabilities Act (ADA) of 1990, as amended, to the extent possible. Needs and considerations regarding the disabled must be addressed and new facilities must comply with ADA standards.

4.17.1.6 San Luis Authorization Act

Congress passed the San Luis Authorization Act in 1960 to authorize the construction and operation of the San Luis Unit and to enable Reclamation to participate in the development of recreation facilities. The San Luis Unit is a part of the CVP and the SWP and is jointly operated by Reclamation and DWR. The principal purpose of the federal portion of the facilities is to furnish approximately 1.25 million acre-feet of water as a supplemental irrigation supply to 600,000 acres located in the western portion of Fresno, Kings, and Merced counties.

4.17.2 State Plans, Policies, and Regulations

4.17.2.1 State Water Code Section 11900-11901 (Implementing the Davis-Dolwig Act)

Chapter 10, Part 3, Division 6 of the California Water Code states that State facilities designed for the storage, conservation, or regulation of water shall be constructed in a manner consistent with the full utilization of their potential for the enhancement of fish and wildlife and to meet recreational needs. It specifies that providing for the enhancement of fish and wildlife and for recreation in connection with water storage, conservation, or regulation facilities benefits all of the people of California and that project construction costs attributable to such enhancement of fish and wildlife and recreation features should be borne by them. It further states that State recreation and the enhancement of fish and wildlife resources are among the purposes of State water projects; that the acquisition of real property for such purposes be planned and initiated concurrently with and as a part of the land acquisition program for other purposes of State water projects; and that facilities for such purposes be ready and available for public use when each State water project having a potential for such uses is completed. DWR is required to operate the SWP Facilities in accordance with this Act.

4.17.2.2 California Public Trust Doctrine

The California Public Trust Doctrine holds that certain resources are above private ownership and reside in the trust of the government for the benefit of the people. It is the duty of the government to administer these resources for the highest public interest. California courts have expanded the scope of the Doctrine to include recreation and environmental benefits. Additionally, the Doctrine has been expanded to include not only navigable waters, but all State-owned lands, fish, and wildlife.

Folsom Lake State Recreation Area General Plan and Amendment

The first Folsom Lake State Recreation Area (SRA) General Plan was approved in 1979. The plan was amended in 1996 to include additional facility recommendations for the Negro Bar (Lake Natoma), Willow Creek (Lake Natoma), and Beals Point (Folsom Lake) areas as part of the American River Bridge Crossing Project at Lake Natoma. The California Department of Parks and Recreation (State Parks) is updating the general plan for the Folsom Lake SRA.

The original 1979 general plan identifies the objectives for both Lake Natoma and Folsom Lake.

Lake Oroville State Recreation Area Resource Management Plan and General Development Plan and Amendment

In 1973, the Lake Oroville SRA Resource Management Plan and General Development Plan were approved. The plans outlined the allowable use intensities and planned development for each area in the SRA. In 1988, an amendment to the plan was approved to address three issues in the Lime Saddle area: acquisition of land, disposal of a parcel, and expansion of the existing Lime Saddle Marina.

San Luis Reservoir State Recreation Area General Development Plan and Amendment

The General Development Plan for the San Luis Reservoir SRA was approved in 1971, although the plan was not developed to the same level of detail used for later State Parks general plans. In 1986, the general development plan was amended to revise the land use designation for about 65 acres of land on the northern side of O'Neill Forebay from undesignated to a day and overnight use designation, thus allowing development of overnight facilities in the Meadows area and boat-in day-use and camping facilities in the Grant Line area. State Parks is updating the general plan for the San Luis Reservoir SRA.

4.17.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to recreation resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.18 Chapter 22: Socioeconomics

4.18.1 Federal Plans, Policies, and Regulations

4.18.1.1 Constitution of the United States: Fifth Amendment Takings Clause

The takings clause of the Fifth Amendment provides that "[n]o person shall be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation." The takings clause does not prohibit the federal government from taking private property; it requires that property owners be compensated for the value of the property taken. According to the U.S. Supreme Court, the takings clause "was designed to bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole" (Armstrong v. United States [1960] 364 U.S. 40, 49). The taking of private property by the government can occur in a number of ways: by direct appropriation, by occupation or invasion, or by regulation (regulatory taking).

Government exactions may be considered unconstitutional takings if they do not meet the "reasonable relationship nexus" test, as set out in Dolan v. City of Tigard (1994) 512 U.S. 374 and Nollan v. California Coastal Commission (1987) 483 U.S. 825. In order for an exaction to be valid: (1) the legislation must serve a legitimate governmental purpose; and (2) the means used to achieve the objective must substantially advance the intended purpose.

4.18.1.2 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970

Title II, Uniform Relocation Assistance, §201(b), establishes a uniform policy for the fair and equitable treatment of persons displaced as a direct result of programs or projects undertaken by a federal agency or with federal financial assistance. The primary purpose of this title is to ensure that such persons shall not suffer disproportionate injuries as a result of programs and projects designed for the benefit of the public as a whole and to minimize the hardship of displacement on such persons.

Title III, Uniform Real Property Acquisition Policy, §301**,** was developed “In order to encourage and expedite the acquisition of real property by agreements with owners, to avoid litigation and relieve congestion in the courts, to assure consistent treatment for owners in the many federal programs, and to promote public confidence in federal land acquisition practices.”

4.18.1.3 Housing and Community Development Act of 1974

Pursuant to §104(d) of the Housing and Community Development Act of 1974, as amended and the implementing regulations at 24 CFR Part 42, a residential anti-displacement and relocation assistance plan is required and must provide for: (1) one-for-one replacement of occupied and vacant occupiable low- and moderate-income dwelling units demolished or converted to another use in connection with a development project assisted under Parts 570 and 92; and (2) provide relocation assistance for all low- and moderate-income persons who occupied housing that is demolished or converted to a use other than for low- or moderate-income housing.

4.18.1.4 U.S. Department of Agriculture

The USDA administers and implements several programs that can influence both how the agricultural sector may react to proposed project activities and how large the direct economic effects on agriculture might be. These programs include the direct and countercyclical payments program, commonly referred to as the farm commodity programs, and the Conservation Reserve Program and similar programs. This section briefly describes important parts of the farm program.

The current farm commodity programs are defined in the Food, Conservation, and Energy Act of 2008, passed by Congress and signed into law in 2008. This law, commonly referred to as the Farm Bill, authorizes the programs for the next five years. At any time, Congress may, with the President’s approval, extend, modify, restructure, or eliminate one or more programs.

The current Farm Bill contains 15 titles that describe and authorize one or more specific programs. Key programs include:

- **Commodity Programs**. Certain agricultural commodities receive price supports and/or direct payments under the 2008 Farm Bill. These include corn, cotton, rice, small grains, grain sorghum, oilseeds, dry peas/lentils, and sugar crops (other crops also are included but are not grown in California). For the crop programs, benefits are paid to producers with eligible historical acreage (called Base Acres) of covered commodities. Some of these payments are available even if the program commodity is no longer grown on that base acreage; however, conversion of the land to nonagricultural uses generally eliminates all commodity program payments.

- **Conservation Reserve and Wetland Reserve Programs**. These programs provide annual payments to farmers willing to enter long-term contracts to maintain vegetative cover on eligible lands or to restore wetlands on previously agricultural land. They also provide cost-sharing and other financial assistance for soil conservation, water conservation, and wildlife conservation activities.

- **Marketing and Credit Assistance**. Numerous programs are designed to provide direct assistance, credit guarantees, and loans to support agriculture.
- **Crop Insurance and Disaster Assistance**. These programs provide subsidized crop insurance to farmers and provide disaster assistance payments to crop and livestock producers in declared disaster counties.

4.18.2 State Plans, Policies, and Regulations

4.18.2.1 California Constitution: Article 1 Declaration of Rights, Section 19

Pursuant to the California Constitution and other statutes, public agencies may use eminent domain power to: (1) acquire private property (real, business, personal, tangible, or intangible property); or (2) reduce the economic value of property for a public purpose (these are referred to as “damages”) if they pay “just compensation” to the owner. Just compensation includes: (1) the fair market value of the real property and its improvements; and (2) any diminution in value of the remaining property when property taken is part of a larger parcel.

4.18.2.2 California Relocation Assistance Act and the California Relocation Assistance and Real Property Acquisition Guidelines

Chapter 16, §7260 to 7277 of the California Government Code states that whenever programs or projects undertaken by a public entity result in the displacement of any person, the displaced person is entitled to payment for actual moving and related expenses as the public entity determines to be reasonable and necessary.

CCR Title 25, Chapter 6 provides guidelines to ensure that uniform, fair, and equitable treatment is afforded persons displaced from their homes, businesses, or farms as a result of the actions of a public entity in order that such persons shall not suffer disproportionate injury as a result of action taken for the benefit of the public as a whole.

4.18.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to socioeconomics, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.19 Chapter 23: Environmental Justice

4.19.1 Federal Plans, Policies, and Regulations

4.19.1.1 Executive Order 12898

EO 12898 provides that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The order calls for the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. "Fair treatment" means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal or commercial operations. Environmental justice is the fair treatment and meaningful involvement of all people – regardless of race, ethnicity, income, or education level – in environmental decision making. Environmental justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities.

4.19.1.2 Council on Environmental Quality Guidance (1997)

CEQ guidance for performing environmental justice analyses as part of the NEPA process provides definitions, thresholds, and overall methodological guidance for environmental justice analyses.

4.19.1.3 U.S. Department of the Interior Environmental Compliance Memorandum No. ECM 95-3

Memorandum No. ECM 95-3 provides guidance for complying with EO 12898 for DOI actions and programs. It stipulates that environmental documents prepared by DOI agencies shall analyze the impact of agency actions on minority and low-income populations. The memorandum directs agencies to evaluate the equity of the impacts imposed on these populations relative to the benefit of the action. The relevant environmental document should identify any such impacts, or the absence of impacts, on minority and low-income populations.

U.S. Department of the Interior Environmental Justice Strategic Plan – 1995

EO 12898 requires federal agencies to develop agency-specific environmental justice plans. The DOI Environmental Justice Strategic Plan – 1995 provides the following goals (1995):

- **Goal 1:** The Department will involve minority and low-income communities as we make environmental decisions and assure public access to our environmental information.
- **Goal 2:** The Department will provide its employees environmental justice guidance and with the help of minority and low-income communities develop training which will reduce their exposure to environmental health and safety hazards.
- **Goal 3:** The Department will use and expand its science, research, and data collection capabilities on innovative solutions to environmental justice-related issues (for example, assisting in the identification of different consumption patterns of populations who rely principally on fish and/or wildlife for subsistence).
- **Goal 4:** The Department will use our public partnership opportunities with environmental and grassroots groups, business, academic, labor organizations, and Federal, Tribal, and local governments to advance environmental justice.

4.19.1.4 U.S. Environmental Protection Agency Office of Environmental Justice's Environmental Justice Implementation Plan (1997)

The Environmental Justice Implementation Plan supplements EO 12898 and its associated Environmental Justice Strategic Plan by providing a timetable for undertaking revisions, as required by the EO, and identifying lead process owners and realistic measures of success.

4.19.1.5 Title VI of the Civil Rights Act of 1964

Title VI, 42 U.S.C. §2000d et seq., was enacted as part of the landmark Civil Rights Act of 1964. It prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance.

4.19.1.6 U.S. Environmental Protection Agency Final Guidance for Incorporating Environmental Justice Concerns in the EPA's National Environmental Policy Act Compliance Analyses (1998)

This framework serves as a guidance to incorporate environmental justice goals into the USEPA's preparation of EISs and environmental assessments (EAs) pursuant to NEPA. This framework emphasizes the importance of selecting an analytical process appropriate to the unique circumstances of the potentially affected community.

4.19.2 State Plans, Policies, and Regulations

The following State regulation is applicable to environmental justice, but is discussed in another section of this chapter, as indicated in parentheses:

- Delta Vision Strategic Plan (Aquatic Biological Resources)

4.19.2.1 Senate Bill 115 (Solis)

Approved in 1999, California SB 115 (Solis) adds §65040.12 to the Government Code and Part 3 to Division 34 of the Public Resources Code, both of which concern environmental justice. The bill provides that the Governor's Office of Planning and Research (OPR) is the coordinating agency in California State government for environmental justice programs.

4.19.2.2 California Government Code Section 65040.12

Pursuant to AB 1553, signed into law in October 2001, §65040.12 requires the OPR to:

1. Consult with the Secretaries of the CalEPA, the Resources Agency, and the Business, Transportation and Housing Agency, the Working Group on Environmental Justice established pursuant to §72002 of the Public Resources Code, any other appropriate State agencies, and all other interested members of the public and private sectors in this state.
2. Coordinate the office's efforts and share information regarding environmental justice programs with the CEQ, USEPA, the General Accounting Office, the Office of Management and Budget, and other federal agencies.
3. Review and evaluate any information from federal agencies that is obtained as a result of their respective regulatory activities under federal EO 12898, and from the Working Group on Environmental Justice established pursuant to §72002 of the Public Resources Code.

4. Establish guidelines for addressing environmental justice issues in City and County general plans, including planning methods for the equitable distribution of public facilities and services, industrial land uses, and the promotion of more livable communities.

4.19.2.3 California State Lands Commission Environmental Justice Policy (October 1, 2002)

The California State Lands Commission (CSLC) developed an Environmental Justice Policy to ensure equity and fairness in its own processes and procedures, and in October 2002, it adopted an amended policy. The policy ensures that "environmental justice is an essential consideration in its processes, decisions, and programs, and that all people who live in California have a meaningful way to participate in these activities". The CSLC implements the policy, in part, by identifying and communicating with relevant populations that could be adversely and disproportionately affected by CSLC projects or programs, and by ensuring that a range of reasonable alternatives is identified to minimize or eliminate environmental impacts affecting such populations. Pursuant to the agency's adopted environmental justice policy, CSLC's staff is required to report back to the Commission regarding how environmental justice is integrated into its programs, processes, and activities.

4.19.2.4 California Public Resources Code Sections 71110 to 71116

Public Resources Code §71110 to 71116 require the CalEPA to develop a model environmental justice mission statement for boards, departments, and offices in the agency. In addition, §71113 requires the CalEPA to convene a Working Group in Environmental Justice to develop a comprehensive environmental justice strategy. The sections also require this strategy to be reviewed and updated. Finally, §71116 establishes a small grant program for nonprofit organizations and federally recognized tribal entities to research environmental justice issues in their community and address larger environmental justice issues.

4.19.2.5 CALFED Environmental Justice Statement

The CALFED Bay-Delta Program states that potential effects of water management changes may accrue to rural communities and that public health and economic impacts may accrue to minorities and disadvantaged people throughout the Delta and vicinity as a result of water quality program actions. Specifically, CALFED identifies three overall guiding principles regarding environmental justice:

- The CALFED Program and its participating agencies are committed to seeking fair treatment of people of all races, cultures, and incomes, such that no segment of the population bears a disproportionately high or adverse health, environmental, social or economic impact resulting from CALFED's programs, policies, or actions.
- The CALFED Agencies will be responsible for ensuring this policy is carried out across all program areas through the development of environmental justice goals and objectives.
- The CALFED Agencies develop the capacity and process to understand, monitor, and address environmental justice issues as the program moves into implementation, including identifying and developing specific methods to address and mitigate environmental justice impacts.

4.19.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to environmental justice, but are discussed in other sections of this chapter, as indicated in parentheses:

- Tehama County General Plan (Land Use)
- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.20 Chapter 24: Air Quality

4.20.1 Federal Plans, Policies, and Regulations

4.20.1.1 Clean Air Act

The federal Clean Air Act (CAA) is the federal law passed in 1970, with amendments in 1977 and 1990. It forms the basis for the national air pollution control effort. Basic elements of the CAA include National Ambient Air Quality Standards (NAAQS) for major air pollutants, hazardous air pollutants standards, state attainment plans, motor vehicle emissions standards, stationary source emissions standards and permits, acid rain control measures, stratospheric ozone protection, and enforcement provisions.

4.20.1.2 National Ambient Air Quality Standards and Federal Air Quality Designations

Pursuant to the CAA, the USEPA established NAAQS for carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_x as SO_2), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), and lead (Pb). These pollutants are referred to as criteria pollutants because numerical health-based criteria have been established that define acceptable levels of exposure for each pollutant. The NAAQS for these pollutants are provided in Chapter 24 Air Quality.

The USEPA has revised the NAAQS several times since their original implementation and will continue to do so as the health effects of exposure to pollution are better understood. As new NAAQS are adopted, ambient air quality monitoring data are reviewed by the regulatory agencies for each geographic area, and the USEPA uses the findings to designate the areas' pollutant-specific attainment status.

The USEPA designates areas as attainment[30], nonattainment[31], or unclassified[32] for individual criteria pollutants depending on whether the areas achieve (i.e., attain) the applicable NAAQS for each pollutant. An area can be designated as attainment for one pollutant (for example, NO_2) and nonattainment for others (for example, O_3 and PM_{10}). Unclassified areas are treated as attainment areas for regulatory purposes.

For some pollutants, there are numerous classifications of the nonattainment designation, depending on the severity of an area's nonattainment status. For example, the O_3 nonattainment designation has eight subclasses: basic, transitional, marginal, moderate, serious, severe 15, severe 17, and extreme.

Pursuant to the 1977 CAA amendments, states (or areas within states) with ambient air quality concentrations that do not meet the NAAQS are required to develop and maintain State Implementation

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[30] Attainment Area: A geographic area considered to have air quality as good as or better than the national and/or State ambient air quality standards (NAAQS and CAAQS, respectively) (USEPA, 2006).

[31] Nonattainment Area: A geographic area identified by the USEPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant (ARB, 2010).

[32] Unclassified Area: A geographic area that lacks monitoring data.

Plans (SIPs). The SIPs constitute a federally enforceable definition of the State's approach and schedule for the attainment of the NAAQS.

Finally, areas that were designated as nonattainment in the past but have since achieved the NAAQS are further classified as attainment maintenance areas. The maintenance classification remains in effect for 20 years from the date when the area is determined by the USEPA to meet the NAAQS. States must obtain USEPA approval of maintenance plans to ensure continued attainment over these 20-year time frames.

4.20.1.3 Federal General Conformity Requirements

The 1977 CAA amendments state that the federal government is prohibited from engaging in, supporting, providing financial assistance for, licensing, permitting, or approving any activity that does not conform to an applicable SIP. In the 1990 CAA amendments, the USEPA included provisions requiring federal agencies to ensure that actions undertaken in nonattainment or attainment maintenance areas are consistent with applicable SIPs. The process of determining whether a federal action is consistent with applicable SIPs is called "conformity" determination.

These conformity provisions were put in place to ensure that federal agencies would contribute to and not undermine efforts to attain the NAAQS. The USEPA has issued two conformity regulations: (1) a transportation conformity regulation that applies to transportation plans, programs, and projects and (2) a general conformity regulation that applies to all other federal actions. A conformity determination is a process that demonstrates how an action would conform to the applicable SIP, and is required only for the project alternative that is ultimately selected and approved. If the emissions cannot be reduced sufficiently and if air dispersion modeling cannot demonstrate conformity, then either a plan for mitigating or a plan for offsetting the emissions would need to be pursued. The general conformity determination is submitted in the form of a written finding that is issued after a minimum 30-day public comment period on the draft determination.

The USEPA general conformity regulation applies only to federal actions that result in emissions of "nonattainment or maintenance pollutants" or their precursors in federally-designated nonattainment or maintenance areas[33]. The general conformity regulation establishes a process to demonstrate that federal actions would be consistent with applicable SIPs and would not cause or contribute to new violations of the NAAQS, increase the frequency or severity of existing violations of the NAAQS, or delay the timely attainment of the NAAQS. The emission thresholds that trigger requirements of the general conformity regulation for federal actions emitting nonattainment or maintenance pollutants, or their precursors, are called *de minimis* levels.

4.20.1.4 Prevention of Significant Deterioration/New Source Review and New Source Performance Standards

The CAA and amendments also include regulations intended to prevent significant deterioration of air quality in attainment or maintenance areas, to provide for New Source Review (NSR) of major sources and modifications in nonattainment areas, and to establish emission performance standards for new stationary sources or new source performance standards (NSPS). Federal Prevention of Significant Deterioration (PSD)/NSR regulations apply to major (generally very large) stationary sources of emissions. NSPS apply to various types of new, modified, or reconstructed emissions units, and apply to

[33] The federal general conformity regulation does not apply to federal actions in areas designated as nonattainment for only the California ambient air quality standards.

such units regardless of whether these units are located at facilities that are "major" sources of emissions for PSD/NSR purposes.

4.20.1.5 Federal Regulations for Hazardous Air Pollutants

Hazardous Air Pollutants (HAPs) are defined as air pollutants that may cause serious human health effects, including mortality, but which are not regulated through issuance of a national ambient air quality standard.

The USEPA has developed regulations to evaluate and, if necessary, mitigate HAPs emissions sources. Prior to the 1990 CAA amendments, the USEPA established pollutant-specific National Emission Standards for Hazardous Air Pollutants (NESHAPs). NESHAPs were established for benzene, vinyl chloride, radionuclides, mercury, asbestos, beryllium, inorganic arsenic, radon 222, and coke oven emissions. The 1990 CAA amendments list 189 total pollutants that are defined as HAPs. For this list of pollutants, the USEPA is required to set standards for categories and subcategories of sources that emit HAPs, rather than for the pollutants themselves. The USEPA began issuing the new standards, referred to as Maximum Achievable Control Technology (MACT) standards, in November 1994. NESHAPs set before 1991 remain applicable.

The applicability of MACT standards is typically determined by each facility's Potential To Emit (PTE) HAPs from all applicable sources. The facility-wide PTE HAP applicability threshold values are 10 tons per year (tpy) for a single HAP and 25 tpy for any two or more HAPs.

4.20.1.6 Federal Standards for Mobile Sources

The USEPA's Office of Transportation and Air Quality regulates air pollution from motor vehicles and engines and the fuels used to operate them. The USEPA defines "mobile sources" to include cars, light-duty trucks, heavy-duty trucks, buses, recreational vehicles (such as dirt bikes and snowmobiles), farm and construction machines, lawn and garden equipment, marine engines, aircraft, and locomotives.

Starting in the 1970s, The USEPA has established progressively more stringent standards for CO, hydrocarbons (HCs), NO_x, and PM emissions from on-road vehicles. Since the early 1990s, the USEPA has developed similar standards for non-road engines and equipment, and also set tighter limits on sulfur allowed in fuels used for mobile sources. Emission standards set limits on the amount of pollution a vehicle or engine can emit, and are designed to force future vehicles and engines to meet stricter standards.

4.20.2 State Plans, Policies, and Regulations

4.20.2.1 California Clean Air Act

California air quality policies are regulated through the California Clean Air Act (CCAA) of 1988. The CCAA provides the State with a comprehensive framework for air quality planning regulation. Prior to passage of the Act, federal law contained the only comprehensive planning framework.

4.20.2.2 Mulford-Carrell Act

This 1967 act established the ARB. The ARB's mission is to promote and protect public health, welfare, and ecological resources through improved air quality. The ARB oversees the activities of local and regional air quality districts.

4.20.2.3 California Ambient Air Quality Standards and State Air Quality Designations

The ARB administers air quality policy in California, establishes statewide standards, and administers the State's mobile-source emissions control program, which is described below. In addition, the ARB oversees air quality programs established by State statute, and oversees programs to achieve the California Ambient Air Quality Standards (CAAQS). These standards are generally more stringent and apply to more pollutants than the NAAQS. In addition to the criteria pollutants, CAAQS have been established for visibility-reducing particulates, hydrogen sulfide, and sulfates. The CAAQS for these pollutants are provided in Chapter 24 Air Quality.

4.20.2.4 State Implementation Plans

Federal clean air laws require nonattainment areas with unhealthy levels of criteria air pollutants to develop SIPs to detail actions that will be undertaken to achieve the NAAQS. In addition, the CCAA requires local air districts in nonattainment areas of the State to prepare and maintain Air Quality Management Plans (AQMPs) to achieve compliance with CAAQS. These AQMPs also serve as a basis for preparing the SIP for the State of California, which must ultimately be approved by the USEPA and codified in the CFR.

SIPs are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, and permitting), district rules, State regulations, and federal control requirements. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel standards and requirements, and limits on emissions from consumer products. State law establishes the ARB as the lead agency for all purposes related to the SIP. Local air districts and other agencies, such as the Bureau of Automotive Repair, prepare SIP elements and submit them to ARB for review and approval. The ARB forwards SIP revisions to the USEPA for approval and publication in the Federal Register. The CFR Title 40, Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items included in the California SIP. The promulgation of the new national 8-hour O_3 standard and $PM_{2.5}$ standards has resulted in additional statewide air quality planning efforts. The California Regional Haze Plan has been drafted to reduce regional haze and improve visibility in national parks and wilderness areas. Many additional California SIP submittals are pending USEPA approval.

In addition to the SIPs aimed at attainment of the NAAQS, the CCAA requires nonattainment areas to achieve and maintain the CAAQS by the earliest practicable date. Local air districts must develop plans to attain the State O_3, CO, SO_2, and NO_2 standards. The CCAA also requires that, by the end of 1994 and once every three years thereafter, the local air districts must assess their progress toward attaining the air quality standards. The triennial assessment is to report the extent of air quality improvement and the amounts of emission reductions achieved from control measures for the preceding three-year period. The districts must review and revise their attainment plans, if necessary, to correct for deficiencies in meeting progress, incorporate new data or projections, mitigate O_3 transport, and expedite adoption of all feasible control measures. In addition to the triennial progress assessment requirement, local air districts must prepare an annual progress report and submit the report to the ARB by December 31 of each year. At a minimum, the annual progress report contains the proposed and actual dates for the adoption and implementation of each measure listed in the previous three-year plan.

4.20.2.5 California Air Toxics Programs

In addition to the criteria pollutants, concern about non-criteria pollutants has increased in recent years. AB 1807 (the Tanner Bill, passed in 1983) established the California Air Toxics Program for identifying and developing emissions control and reduction methods for toxic air contaminants (TACs). The bill formally designated 18 substances as TACs. In 1993, the 189 HAPs identified by the USEPA were incorporated into California law as TACs. Other pollutants have been added more recently, such as particulate emissions from diesel-fueled engines (diesel PM), designated by California as a carcinogen. The California Air Toxics Program also includes provisions for public awareness and risk reduction.

Local agencies, such as air districts, are responsible for evaluating and controlling TAC emissions, especially when these emissions are released from projects near sensitive receptors. For example, AB 3205 requires that new or modified sources of TACs near schools provide public notice to the parents of school children before a permit to emit air pollutants is issued. One air toxics control measure adopted by the ARB in 2004 prohibited operation of diesel-fueled backup engines within 500 feet of a school during school hours, unless used in an emergency.

The Air Toxics “Hot Spots” Information and Assessment Act was enacted in September 1987. The act requires that toxic air emissions from stationary sources (facilities) be quantified and compiled into an inventory, that risk assessments be conducted according to methods developed by the California Office of Environmental Health Hazard Assessment (OEHHA), and that the public be notified of significant risks posed by nearby facilities. Since the amendment of the statute in 1992 by enactment of SB 1731, facilities that pose a potentially significant health risk to the public are required to reduce their risks.

4.20.2.6 California Mobile-Source Emission Control Programs

The ARB is responsible for developing statewide programs and strategies to reduce the emission of smog-forming pollutants and TACs by mobile sources. To attain the CAAQS, the CCAA mandates that the ARB achieve the maximum degree of emission reductions from all on- and off-road mobile sources. On-road sources include passenger cars, motorcycles, trucks, and buses; off-road sources include heavy-duty construction equipment, recreational vehicles, marine vessels, lawn and garden equipment, and small utility engines. On-road vehicle emission control programs overseen by the ARB include:

- Vehicle inspections
- Idling restrictions
- Regulations to require clean vehicle fleets
- Voluntary vehicle retirement programs
- Engine emissions standards

Additionally, exhaust emission standards have been adopted by the ARB and USEPA for off-road engines. ARB has extensive statewide programs underway to reduce particulate emissions from diesel-fueled engines, also known as diesel PM.

4.20.3 Regional and Local Plans, Policies, and Regulations

In California, air districts have been established to oversee the attainment of air quality standards within air basins as defined by the State. Each local air district has developed its own program and regulations to attain and maintain air quality standards while integrating federal and State requirements. The local air districts have permitting authority over all stationary sources of air pollutants within their district boundaries and provide the primary review of environmental documents prepared for projects with air quality issues. In many cases, the local air districts have established CEQA guidelines and significance thresholds for review of air-quality related impacts.

This section briefly describes applicable local air district rules and regulations, regional SIP and AQMP submittals, CEQA guidance documents, and air quality elements of General Plans for counties and cities in Glenn and Colusa counties.

4.20.3.1 Regional and Local Air Quality Management Plans

The Air Pollution Control Districts and Air Quality Management Districts for the counties located in the northern portion of the Sacramento Valley comprise the Northern Sacramento Valley Planning Area (NSVPA). The NSVPA Districts have jointly prepared and adopted a uniform AQMP for the purpose of achieving and maintaining healthful air quality throughout the air basin. The 2009 triennial update of the NSVPA Air Quality Attainment Plan (Plan) addresses the progress made in implementing the 2006 Plan and proposes modifications to the strategies necessary to attain the 1-hour ozone CAAQS at the earliest practicable date.

The 2009 Plan identifies those portions of the NSVPA designated as “non-attainment” for the CAAQS, and discusses the health effects related to the various air pollutants. All of the NSVPA Districts have been designated as non-attainment areas for the CAAQS for PM_{10}. Moreover, all of the Districts, with the exception of Colusa and Glenn counties, have been designated as non-attainment areas for the State standard for ozone. Colusa and Glenn counties have been designated as non-attainment transitional areas for ozone. Similar to the 1994, 1997, 2000, 2003 and 2006 Plans, the 2009 Plan focuses on the adoption and implementation of control measures for stationary sources, area-wide sources, and indirect sources, and addresses public education and information programs. The 2009 Plan also addresses the effect that pollutant transport has on the ability of the NSVPA to meet and attain the CAAQS.

According to the 2009 Triennial Plan, ozone violations in the NSVPA are caused, in part, by combustion sources and are occasionally influenced by smoke impacts from wildfires. The primary emission source is the internal combustion engine. The ozone problem is further aggravated by transport from the Broader Sacramento Area (BSA), which is comprised of Sacramento County and portions of El Dorado, Placer, Sutter, and Yolo counties. Ozone is formed by a photochemical reaction between nitrogen oxides and reactive organic gases. These ozone precursors are emitted as part of the exhaust of internal combustion engines in the NSVPA and BSA, and are transported northward via the prevailing winds. Due to the regional nature of the ozone problem and the fact that the NSVPA counties share the same air basin with BSA, the Attainment Plan is prepared in conjunction with the Sacramento Valley Air Quality Engineering and Enforcement Professionals and the Sacramento Valley Air Basin-wide Air Pollution Control Council’s Technical Advisory Committee.

The CCAA requires each District in which a CAAQS for ozone is exceeded to develop a plan and an emission control program to attain the State standard. The CCAA recognizes that ozone and ozone precursors can be transported by winds over long distances and thereby contribute to air quality problems outside of the District or air basin of origination. To address this, the CCAA requires upwind Districts to mitigate the impacts to downwind areas by pollutants that are originally emitted in the upwind Districts, even though the downwind District may have a shared or sole responsibility for air quality impacts. The CCAA directs the ARB to assess the impacts of such transport and to establish mitigation requirements for upwind Districts.

For transport mitigation, the CCAA requires that Districts within the areas of origin of transported air pollutants must include sufficient emission control measures in their ozone Attainment Plans to mitigate the impacts of their jurisdictional pollution sources on ozone concentrations in downwind areas. At a minimum, the Attainment Plans for Districts within the BSA must require the adoption and implementation of best available retrofit control technology on all existing stationary sources of ozone precursor emissions, as expeditiously as practicable. The plans must include measures sufficient to attain the State ambient air quality standard for ozone by the earliest practicable date, except during air pollution episodes. Implementation of these requirements will be through the BSA Districts' Attainment Plans.

4.20.3.2 Local Air District CEQA Guidance Documents Pertaining to Air Quality

Local air agencies may publish CEQA guidelines to assist local jurisdictions and lead agencies in complying with the requirements of CEQA regarding potentially adverse impacts to air quality. CEQA guidelines may or may not include thresholds of significance. Guidelines may provide useful information for calculating air pollution emissions, evaluating the health impacts of air pollutants, and identifying potential mitigation measures.

Air districts are required to develop and enforce local rules and regulations to attain and maintain healthful air within their jurisdiction. In past years, air districts were primarily concerned with emissions of criteria air pollutants, ozone precursors, odors, and toxic air contaminants.

The Glenn County Air Pollution Control District (GCAPCD) and the Colusa County Air Pollution Control District (CCAPCD) have developed plans and regulations to attain and maintain air quality standards while integrating federal and State requirements. For example, each of the agencies has developed regulations to cover new source review and permitting of stationary sources, agricultural burning, airborne toxic control measures, and federal operating permits.

The GCAPCD does not have CEQA guidelines; GCAPCD indicated that they would defer to the Butte County guidelines, if necessary, when reviewing the proposed Project. The Butte County AQMD published its CEQA Air Quality Handbook *Guidelines for Assessing Air Quality Impacts for Projects Subject to CEQA Review* in 2008. The CCAPCD also does not have CEQA guidelines, other than its New Source Review rules, and suggested that thresholds developed by the Tehama County Air Pollution Control District (TCAPCD) would represent similar values. Review of the Butte County and Tehama County thresholds indicates that they are the same values.

4.20.3.3 Glenn County and Colusa County General Plans

Glenn and Colusa counties have developed General Plans that include air quality policies. The 1993 Glenn County General Plan Update includes provisions to reduce air pollutant emissions, but the Draft EIR for the Update acknowledges that in nonattainment air basins, any emissions of nonattainment pollutants by new developments are considered to be a significant air quality effect, both directly and cumulatively. The Draft EIR indicates that many or most of the development projects that would be considered pursuant to the General Plan would potentially result in emissions of ozone precursors, which are associated with vehicular traffic, and PM_{10}, which can be emitted by construction activities, wood-burning appliances, yard burning, and incineration. The General Plan is intended to be compatible with the goals and policies of the local Air Quality Attainment Plan. Policies and implementation measures are included in the General Plan that require projects to incorporate all feasible emissions control measures, as specified in the Attainment Plan.

The 2012 Colusa County General Plan includes policies and action programs aimed at preserving air quality as part of the Conservation Element. The recommended measures include ongoing oversight by the CCAPCD for air monitoring, enforcement of local, State, and federal air quality rules, health risk assessment and mitigation of air toxics, and mitigation of significant impacts to the maximum extent feasible. The General Plan requires a compact development pattern to reduce vehicle trips and promote alternative transportation methods, and requires projects to mitigate significant air quality impacts associated with construction and operation.

4.21 Chapter 25: Climate Change and Greenhouse Gas Emissions

4.21.1 Federal Plans, Policies, and Regulations

4.21.1.1 Draft National Environmental Policy Act Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions

The DOI has considered the issue of climate change in a manner consistent with other federal agencies, and discusses how to address and integrate the topic into NEPA documents. DOI recommends that agencies consider two ways to address climate change in NEPA documents, which are not mutually exclusive: (1) address the effect of climate change on proposed federal actions, and (2) evaluate how proposed federal actions (either individually or cumulatively) would affect climate change.

Agencies can use the NEPA process to reduce vulnerability to climate change impacts, adapt to changes in our environment, and mitigate the impacts of federal agency actions that are exacerbated by climate change.

This CEQ guidance document advises federal agencies that they should consider opportunities to reduce greenhouse gas (GHG) emissions caused by proposed federal actions and adapt their actions to climate change impacts through the NEPA process and to address these issues in their agency NEPA procedures. The document recommends a standard of 25,000 metric tons/year carbon dioxide equivalent (CO_2e) as GHG emissions. CEQ does not propose this standard as the threshold for significance, but rather as an indicator of the minimum level of GHG requiring NEPA analyses.

4.21.1.2 Greenhouse Gas Reporting Rule

In response to the fiscal year (FY) 2008 Consolidated Appropriations Act[34] which required the USEPA to develop "…mandatory reporting of greenhouse gases above appropriate thresholds in all sectors of the economy….", the USEPA issued the Greenhouse Gas Reporting Rule (74 FR 56260). The rule went into effect January 1, 2010, and requires reporting of greenhouse gas (GHG) data and other relevant information from large sources and suppliers in the United States. The GHG Reporting Rule applies to fossil fuel and industrial GHG suppliers, vehicle and engine manufacturers, and all facilities that emit 25,000 metric tons of CO_2e or more per year. Facility owners are required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The GHG Reporting Rule also mandates recordkeeping and administrative requirements in order for the USEPA to verify annual GHG emissions reports.

4.21.1.3 Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act

The USEPA Administrator signed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act on December 7, 2009, and the final rule became effective on January 14, 2010. The Endangerment Finding is based on Section 202(a) of the CAA, which

[34] Appropriates funds for FY2012 for military activities including, but not limited to: military personnel, operations and maintenance, procurement, research and development, and other related agencies and defense programs.

states that the USEPA Administrator should regulate and develop standards for “emission[s] of air pollution from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.” The rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., CO_2, methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere which threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs, and therefore, to the threat of climate change.

The observed and projected results of climate change (e.g., higher likelihood of heat waves, wildfires, droughts, sea level rise, and higher intensity storms) are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The finding cites that in 2006, motor vehicles were the second largest contributor to domestic GHG emissions (24 percent of total) behind electricity generation. In 2005, the United States was responsible for 18 percent of global GHG emissions.

Although the Endangerment Finding does not directly establish reduction goals or mandates for GHG emissions, the finding would obligates the USEPA to establish GHG emission standards for new motor vehicles, motor vehicle engines, and potential stationary sources (such as bioenergy production facilities) pursuant to the CAA. Any potential GHG emission standards resulting from the Endangerment Finding would be relevant to the GHG emission sources associated with proposed Project operations.

4.21.2 State Plans, Policies, and Regulations

4.21.2.1 California Environmental Quality Act Guidelines

CEQA requires lead agencies to consider the reasonably foreseeable adverse environmental effects of projects they are considering for approval.

In January 2009, OPR released preliminary draft CEQA Guidelines Amendments for GHGs consistent with the authority granted by CEQA and with CEQA case law. OPR’s recommendations for GHGs in the Guidelines Amendments fall within the existing CEQA framework for environmental analysis, which calls for lead agencies to determine baseline conditions and levels of significance, and to evaluate mitigation measures. For these reasons, OPR neither identifies a threshold of significance for GHG emissions nor prescribes assessment methodologies or specific mitigation measures. The Guidelines Amendments also encourage lead agencies to consider many factors in performing a CEQA analysis, but to preserve the discretion that CEQA grants lead agencies to make their own determinations based on substantial evidence. The Guidelines Amendments also encourage public agencies to make use of programmatic mitigation plans and programs from which to tier when they perform individual project analyses.

4.21.2.2 Senate Bill 97

SB 97 required OPR, by July 1, 2009, to prepare, develop, and transmit to the Resources Agency (now called the Natural Resources Agency), guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, including but not limited to, effects associated with transportation or energy consumption. The Natural Resources Agency was required to certify and adopt those guidelines by January 1, 2010[35], and OPR is required to periodically update the guidelines to incorporate new information or criteria established by ARB pursuant to AB 32.

On December 30, 2009, the California Natural Resources Agency adopted amended guidelines to aid public agencies and developers in complying with CEQA. The guidelines expressly require that GHG emissions be included in the environmental impact analysis under CEQA.

4.21.2.3 Governor's Office of Planning and Research Technical Advisory on CEQA and Climate Change

In response to the requirements of SB 97, OPR released a technical advisory in June 2008 to provide interim advice to lead agencies regarding the analysis of GHGs in environmental documents. The advisory encourages lead agencies to identify and quantify the GHGs that could result from a proposed project, analyze the impacts of those emissions to determine whether they would be significant, and to identify feasible mitigation measures or alternatives that would reduce any adverse impacts to a less-than-significant level.

Without prescribing specific approaches, the advisory identified several methodologies for estimating project emissions and provided examples of mitigation measures that lead agencies could employ to reduce those emissions.

A consistent approach should be applied for the analysis of all such projects, and the analysis must be based on best available information. For these projects, compliance with CEQA entails three basic steps:

- Identify and quantify the GHG emissions
- Assess the significance of the impact on climate change
- If the impact is found to be significant, identify alternatives and/or mitigation measures that will reduce the impact below significance

The advisory discussed alternative project designs and locations that conserve energy and water, measures that reduce vehicle miles traveled by fossil-fueled vehicles, measures that contribute to established regional or programmatic mitigation strategies, and measures that sequester carbon to offset emissions from the project. The advisory recognized that mitigating GHGs at a project level may not be as effective as implementing a programmatic approach to mitigation. This approach requires public agencies to adopt a program of mitigation measures that apply broadly within the agency's jurisdiction, and are implemented at the project level when CEQA review is required.

4.21.2.4 Executive Order S-3-05

EO S-3-05 includes the following GHG reduction targets for California: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels. The final emission target of 80 percent below 1990 levels would put the State's emissions in line with estimates of the required worldwide reductions needed to bring about long-term climate stabilization and avoidance of the most severe impacts of climate change.

35 As directed by SB97, the Natural Resources Agency adopted Amendments to the CEQA Guidelines for GHG emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the CCR. The Amendments became effective on March 18, 2010.

4.21.2.5 California Renewables Portfolio Standard Program

Established in 2002 pursuant to SB 1078 (required 20 percent renewable energy by 2017), accelerated in 2006 pursuant to SB 107 (accelerated 20 percent deadline to 2010), and expanded in 2011 pursuant to SB 2 (increased requirement to 33 percent by 2020), California's Renewables Portfolio Standard program requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020.

4.21.2.6 Assembly Bill 32 (California Global Warming Solutions Act of 2006)

AB 32, the California Global Warming Solutions Act of 2006, places caps on statewide GHG emissions equal to 1990 emissions levels. The statute requires that prior to January 1, 2008, ARB must: (1) identify the current level of GHG emissions by requiring statewide reporting and verification of GHG emissions from emitters; and (2) identify the 1990 levels of California GHG emissions. Pending these regulations, by June 30, 2007, ARB must publish a list of early-action GHG emission reduction measures and by January 1, 2010, must adopt regulations to implement those early-action measures. As of 2012, the ARB reported that these goals have been met and the State is on track to reach its 2020 goal. The 2020 goal is to attain 1990 emission levels (427 million metric tons [MMT] of CO_2e of GHGs).

4.21.2.7 Senate Bill 1368

SB 1368 requires the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC), in consultation with ARB, to set performance standards for climate change pollutant emissions resulting from electric generation for long-term procurement by investor-owned and local publicly-owned utilities. This bill applies to individual utilities and requires compliance when funding new, or rehabilitating older, power generation facilities.

4.21.2.8 Executive Order S-1-07

EO S-1-07 requires that carbon intensity of transportation fuels be reduced by at least 10 percent by 2020. This mandates that ARB establish and certify such standards, including biennial reports on the goal progress.

4.21.2.9 Executive Order S-13-08

EO S-13-08 required the Natural Resources Agency[36] to conduct public workshops on sea level rise and requested that the National Academy of Sciences (NAS) complete a California Sea Level Rise Assessment Report. This EO dictates that the California Ocean Protection Council shall work with DWR, the CEC, California's coastal management agencies, and the SWRCB to conduct a review of the NAS assessment every two years, or as necessary.

4.21.2.10 Senate Bill 1771

SB 1771 requires that the nonprofit public benefit corporation known as the California Climate Action Registry administer a voluntary GHG emissions registry. CEC is required to provide technical guidance to the Registry on protocol development and to periodically update the State's inventory of GHG emissions, as well as serve as an information clearinghouse on climate change issues. The Registry consists of organizations that are actively reducing their GHG emissions.

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[36] Includes the California Conservation Corps, the Department of Boating and Waterways, the Department of Conservation, CDFG, the Department of Forestry and Fire Protection, the Department of Parks and Recreation, the Department of Resources Recycling and Recovery, and DWR.

4.21.2.11 Climate Change Scoping Plan

In October 2008, ARB published the Climate Change Proposed Scoping Plan (CCPSP), which is the State's plan to achieve GHG reductions in California, as required by AB 32. The CCPSP was approved by ARB on December 11, 2008. The CCPSP contains the main strategies California will implement to achieve a reduction of approximately 169 MMT (approximately 30 percent) in CO2e emissions, relative to the State's projected 2020 emissions level of 596 MMT of CO2e under a business-as-usual scenario. The CCPSP includes ARB-recommended GHG reductions for each emissions sector of the State's GHG inventory. The largest recommended GHG reductions are:

- Improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT of CO_2e)
- Implementation of the low-carbon fuel standard (15.0 MMT of CO_2e)
- Implementation of energy efficiency measures in buildings and appliances, and the widespread development of combined heat and power systems (26.3 MMT of CO_2e)
- A renewable portfolio standard for electricity production (21.3 MMT of CO_2e)

4.21.2.12 California Climate Change Adaptation Strategy

The 2009 California Climate Adaptation Strategy report summarizes the best known science on climate change impacts (public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture; forestry, and transportation and energy infrastructure) in the state to assess vulnerability and outlines possible solutions that can be implemented within and across State agencies to promote resiliency.

4.21.2.13 California Cap and Trade Program

The Cap and Trade Program is a market-based regulation that sets a firm statewide limit on sources responsible for 85 percent of California's GHG emissions, and establishes a price signal needed to drive long-term investment in cleaner fuels and more efficient use of energy. The program is designed to provide covered entities the flexibility to seek out and implement the lowest-cost options to reduce emissions. California's Cap-and-Trade Regulation took effect on January 1, 2012, with amendments to the regulation effective September 1, 2012. The enforceable compliance obligation began on January 1, 2013.

4.21.2.14 Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan

DWR developed a GHG Emissions Reduction Plan to guide its project development and decision making with respect to energy use and GHG emissions. The Plan details DWR's future plans for reducing GHG emissions consistent with the GHG emissions reduction targets established in AB 32, EO S-3-05, and DWR's own policies; the aggressive steps DWR will take to reduce its emissions by more than 80 percent below 1990 levels; and the steps that DWR will take to monitor its progress toward achieving these reductions. The Plan shows how DWR will achieve its near-term goal of reduced emissions by 50 percent below 1990 levels by 2020, and how DWR will achieve its long-term goal of reduced emissions by 80 percent below 1990 levels by 2050.

4.21.2.15 California Air Pollution Control Officers Association Guidance Documents on Addressing GHGs under CEQA and Quantifying GHG Mitigation Measures

The California Air Pollution Control Officers Association has prepared two reports intended as a resource for public agencies to address GHG emissions pursuant to CEQA and to quantify greenhouse gas mitigation measures. The reports are titled "CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas

Emissions from Projects Subject to the California Environmental Quality Act, January 2008" and "Quantifying Greenhouse Gas Mitigation Measures, August 2010." These reports consider the application of thresholds and offer three alternative programmatic approaches toward determining whether GHG emissions are significant. These reports also evaluate tools and methodologies for estimating impacts and summarizing mitigation measures. They have been prepared with the understanding that the programs, regulations, policies, and procedures established by the ARB and other agencies to reduce GHG emissions may ultimately result in a different approach pursuant to CEQA than the strategies considered in these reports.

4.21.3 Regional and Local Plans, Policies, and Regulations

The following local regulation is applicable to climate change and greenhouse gases, but is discussed in another section of this chapter, as indicated in parentheses:

- Regional and Local Air Quality Management Plans (Air Quality)

4.22 Chapter 26: Navigation, Transportation, and Traffic

4.22.1 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to navigation, transportation, and traffic, but are discussed in other sections of this chapter, as indicated in parentheses:

- National Environmental Policy Act (General)
- Rivers and Harbors Act of 1899 (Surface Water Quality)

4.22.2 State Plans, Policies, and Regulations

The following State regulation is applicable to navigation, transportation, and traffic, but is discussed in other sections of this chapter, as indicated in parentheses:

- California Environmental Quality Act (General)

4.22.2.1 California Department of Transportation Regulatory Authority over the California State Highway System

The California Department of Transportation (Caltrans) has regulatory authority over the State highway system. Additionally, as part of a pilot program established by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Caltrans and FHWA have entered into a Memorandum of Understanding (MOU) in which certain authority pursuant to NEPA has been delegated to Caltrans in connection with the delivery of transportation projects. This MOU may apply to any potential effects to the State highway system from the proposed Project.

4.22.3 Regional and Local Plans, Policies, and Regulations

The following regulations are applicable to navigation, transportation, and traffic, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.23 Chapter 27: Noise

4.23.1 Federal Plans, Policies, and Regulations

4.23.1.1 Federal Guidance for Environmental Noise and Regulations for Specific Sources

Although no federal regulations limit overall environmental noise levels, federal guidance is provided by several federal agencies for specific sources (for example, aircraft or federally funded highways). The following federal agencies have such guidance: the Federal Energy Regulatory Commission (FERC), Federal Transit Administration, Federal Railroad Administration, FHWA, Federal Aviation Administration, USEPA, and the U.S. Department of Housing and Urban Development.

4.23.2 State Plans, Policies, and Regulations

4.23.2.1 California Noise Control Act of 1973

The California Noise Control Act of 1973 (Health and Safety Code §46000 to 46080) states that the Office of Noise Control should provide assistance to local communities in developing local noise control programs, and that the Office of Noise Control staff would also work with the OPR to provide guidance for the preparation of the required Noise Elements in city and county General Plans, pursuant to Government Code §65302(f). In preparing the Noise Element, a city or county must identify local noise sources and analyze and quantify, to the extent practicable, current and projected noise levels for various sources, including highways and freeways; passenger and freight railroad operations; ground rapid transit systems; commercial, general, and military aviation and airport operations; and other ground stationary noise sources. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure.

4.23.2.2 Department of Water Resources Specification 05-16

Section 15070 of DWR Specification 05-16 suggests the following guidelines for DWR construction projects: Where ambient noise levels are less than 60 dBA and it is determined that construction related noise will cause noise levels to exceed 60 dBA, or where the ambient noise levels are greater than 60 dBA and it is determined that construction related noise will cause noise levels to exceed the ambient level by 5 dBA, a temporary sound wall shall be constructed between the sensitive area and the construction related noise source. The 60 dBA limit is not a regulatory requirement.

4.23.2.3 California Administrative Code Title 4

California Administrative Code Title 4 has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure.

4.23.2.4 California Government Code §65302(f)

California Government Code §65302(f) requires City and County General Plans to include a Noise Element. The purpose of a Noise Element is to guide future development to enhance future land use compatibility.

4.23.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to noise, but are discussed in other sections of this chapter, as indicated in parentheses:

- Tehama County General Plan (Land Use)
- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.24 Chapter 28: Public Health and Environmental Hazards

4.24.1 Federal Agencies Responsible for Regulating Water Quality

The USEPA provides guidance and oversight to the State of California in regulating water quality, as it does for other states and tribes. The USEPA delegates authorities for establishing water standards and regulating controllable factors affecting water quality in the State. In California, this authority is delegated to the SWRCB. The SWRCB, in turn, delegates authority to its nine RWQCBs to implement the State's water quality management responsibilities in the nine geographic regions. Although the State generally takes the lead on developing and adopting water quality standards for California, the USEPA must approve new or modified standards. Thus, the USEPA, SWRCB, and the RWQCBs have worked together to establish existing water quality criteria/objectives and beneficial uses.

4.24.2 Federal Plans, Policies, and Regulations

The following federal regulations are applicable to public health and environmental hazards, but are discussed in other sections of this chapter, as indicated in parentheses:

- Clean Water Act (Surface Water Resources)
- Comprehensive Environmental Response, Compensation, and Liability Act (Surface Water Quality)
- Federal Insecticide, Fungicide, and Rodenticide Act (Surface Water Quality)
- Safe Drinking Water Act (Surface Water Quality)

4.24.2.1 Hazardous Materials Transportation Act of 1975

The objective of the Hazardous Materials Transportation Act is to improve the regulatory and enforcement authority of the Secretary of Transportation to protect the Nation adequately against risks to life and property which are inherent in the transportation of hazardous materials in commerce. The Act empowered the Secretary of Transportation to designate as hazardous material any particular quantity or form of a material that may pose an unreasonable risk to health and safety or property.

Regulations apply to any person who transports, or causes to be transported or shipped, a hazardous material; or who manufactures, fabricates, marks, maintains, reconditions, repairs, or tests a package or container which is represented, marked, certified, or sold by such person for use in the transportation in commerce of certain hazardous materials.

4.24.2.2 Resource Conservation and Recovery Act, as Amended

The Resource Conservation and Recovery Act (RCRA) provides the USEPA with the authority to control hazardous waste from cradle-to-grave. This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. The 1984 Federal Hazardous and Solid Waste Amendments to the RCRA focus on waste minimization and phasing out land disposal of hazardous waste, as well as corrective action for releases. Other mandates of this law include increased enforcement authority for the USEPA, more stringent hazardous waste management standards, and a comprehensive Underground Storage Tank Program. The 1986 RCRA amendments enabled the USEPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. The RCRA also set forth a framework for the management of non-hazardous solid wastes. RCRA §3006 provides the USEPA with the authority to authorize State hazardous waste programs. Once authorized, the State program operates in lieu of the federal program, although the USEPA retains enforcement authority even after a State program has been authorized.

4.24.2.3 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 gives the USEPA authority to require reporting, recordkeeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. The Act addresses the production, import, use, and disposal of specific chemicals including polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint.

4.24.3 State Plans, Policies, and Regulations

The following State regulation is applicable to public health and environmental hazards, but is discussed in another section of this chapter, as indicated in parentheses:

- California Safe Drinking Water Act (Surface Water Quality)

4.24.3.1 California Hazardous Substance Account Act of 1999

The California equivalent to CERCLA, the California Hazardous Substance Account Act, was adopted in 1999 and is codified in Division 20 of the Health and Safety Code, Chapter 6.8. It requires past and present owners and operators to assume liability for the remediation of hazardous waste sites within the State of California.

The Health and Safety Code Section 25356.1 requires the Department of Toxic Substances Control or the RWQCB to prepare or approve remedial action plans for sites where hazardous substances were released to the environment if they are listed as Superfund sites. The RWQCB has the responsibility to make decisions regarding cleanup and abatement goals and objectives for the protection of water quality.

4.24.3.2 California Land Reuse and Revitalization Act

This 2004 regulation provides immunity from liability for hazardous materials response costs, or damage claims to innocent landowners, bona fide purchasers, and contiguous property owners.

Similar to the 1996 CERCLA amendments, to encourage site cleanup, the California Land Reuse and Revitalization Act of 2004 was codified in the Health and Safety Code, Division 20, Chapter 6.82, Sections 25395.60 to 25395.105. This chapter encourages the development and redevelopment of urban properties, provides processes that ensure remediation to protect public health, safety, and the environment, and relieves innocent owners, bona fide prospective purchasers, and owners of property adjacent to contaminated sites of liabilities and responsibilities that should be borne by those who caused or contributed to the contamination.

4.24.3.3 California Underground Storage Tank Program

The California Underground Storage Tank Program is designed to prevent contamination from, and improper storage of, hazardous substances stored underground; to ensure that existing tanks are properly maintained, inspected, tested, and upgraded; and to ensure that new USTs meet appropriate standards. The California regulations are codified in the Health and Safety Code, Division 20, Chapter 6.7, Sections 25280 to 25299.8.

4.24.3.4 Aboveground Petroleum Storage Act of 2007

California adopted a statewide program to determine the amount and type of hazardous substances being stored in aboveground tanks under the Health and Safety Code Division 20, Chapter 6.67, Sections 25270 to 25270.23.

4.24.3.5 Toxic Injection Well Control Act of 1985

Injection of hazardous wastes is regulated pursuant to the Toxic Injection Well Control Act of 1985, Health and Safety Code Division 20, Chapter 6.5, Article 5.5, Sections 25159.10 to 25159.25. These regulations prohibit any injection of hazardous wastes into or above drinking water sources and prohibit injection of hazardous waste below drinking water sources, so as to prevent hazardous wastes from migrating to State drinking water, or otherwise endangering the environment.

4.24.3.6 Safe Drinking Water and Toxics Enforcement Act

The Safe Drinking Water and Toxics Enforcement Act (SDWTEA) was passed in August of 2003 and contains prohibitions preventing the contamination of drinking water with chemicals known to cause cancer or reproductive toxicity. The SDWTEA also requires a reasonable warning be provided before any person is exposed to chemicals known to cause cancer or reproductive toxicity.

4.24.3.7 California Hazardous Waste Control Act

Pursuant to this Act, the State is authorized to administer a hazardous waste program equivalent to the federal RCRA program. Generation, transportation, treatment, storage, and disposal of characteristic and listed hazardous wastes are regulated pursuant to the Health and Safety Code, Division 20, Chapter 6.5, Sections 25100 to 25250.28.

As part of hazardous waste regulation, the California Health and Safety Code, Division 20, Chapter 6.5, Article 13, Sections 25250 through 25250.28 regulates PCBs in used oil, and prohibits used oil recycling or reuse if the oil contains five parts per million or greater of PCBs.

4.24.3.8 California Solid Waste Program (Public Resources Code 43000 et seq., California Code of Regulations Titles 14 and 27)

Solid waste in California is regulated pursuant to Title 14, Division 7, and Title 27, Division 2 of the CCR. These regulations establish minimum standards for the handling and disposal of solid wastes. Both the SWRCB and the California Integrated Waste Management Board have oversight and approval authority over local enforcement agencies that permit and take enforcement action on solid waste management facilities. The Public Resources Code Sections 43200 to 43219, 43020, 43020.1, 43021, 43030, 43101 and 43103 created and govern the local enforcement agencies.

4.24.3.9 Hazardous Materials Release Response Plans and Inventory

California's equivalent to SARA was codified in the Health and Safety Code Division 20, Chapter 6.95, Sections 25500 to 25545. This code requires businesses to prepare plans relating to the handling and release or potential release of hazardous materials. It establishes minimum statewide standards for contents of plans, including location, type, quantity, and health risks of hazardous materials handled, used, stored, or disposed of, which could be accidentally released into the environment. It ensures firefighters, health officials, planners, public safety officers, health care providers, regulatory agencies, and other interested persons have access to the plans.

4.24.3.10 State Water Resources Control Board Resolution No. 92-49

SWRCB adopted Resolution Number 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges, under Water Code Section 13304. This resolution establishes policies and detailed procedures for all investigations and remediation of any discharge that causes, or threatens to cause, conditions of soil, water pollution, or nuisance associated with migration of waste or fluid from waste management units. The resolution also requires coordination among other agencies including the DTSC, the USEPA, and local governances.

4.24.3.11 Mosquito Abatement Act of 1915

The Mosquito Abatement Act authorizes the formation of mosquito control districts in the State of California. It gives local governments the power to obtain revenues and form special districts to protect the public from the hazards of mosquito bites and mosquito-borne diseases.

4.24.3.12 California Health and Safety Code: Division 3, Chapter 1, Article 4, Sections 2040, 2041, 2060 to 2065 (Mosquito and Vector Control District Law)

Sections 2040 and 2041 of the California Health and Safety Code, Division 3, Chapter 1, Article 4 authorize mosquito control districts to conduct surveillance programs and studies, and take any and all necessary and proper actions to prevent the occurrence of, and abate or control, vectors and vectorborne diseases.

Sections 2060 to 2065 authorize mosquito control districts to abate a public nuisance by notifying the owner of the property that is causing the public nuisance, requiring the owner of the property to abate the nuisance within a specified time, and requiring the owner of the property to prevent the recurrence of the public nuisance. These sections also authorize the mosquito control districts to impose fines for non-compliance, and state that the owner of the property shall pay for the cost of abatement.

4.24.3.13 California Government Code: Title 3, Division 2, Part 2, Chapter 8, Article 3, Section 25842.5

This section of the California Government Code states that the Board of Supervisors may provide the same services and exercise the powers of mosquito abatement districts or vector control districts formed pursuant to the Mosquito Abatement and Vector Control District Law within both the unincorporated and incorporated territory of the county with the consent of the City Council and after holding a public hearing on the proposal. Notice of the hearing must be given, pursuant to Section 6061, in a newspaper of general circulation in the county.

4.24.3.14 California Mosquito-Borne Virus Surveillance and Response Plan

The California Mosquito-borne Virus Surveillance and Response Plan was developed to meet several objectives. Specifically, the Plan:

- Provides guidelines and information on the surveillance and control of mosquito-borne viruses in California, including West Nile, St. Louis encephalitis, and western equine encephalomyelitis viruses;
- Incorporates surveillance data into risk assessment models;
- Prompts surveillance and control activities associated with virus transmission risk level;
- Provides local and State agencies with a decision support system; and
- Outlines the roles and responsibilities of local and State agencies involved with mosquito-borne virus surveillance and response.

4.24.4 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to public health and environmental hazards, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.25 Chapter 29: Public Services and Utilities

4.25.1 Federal Plans, Policies, and Regulations

Federal regulatory agency involvement for public services and utilities is limited to review of a public service/utility provider's operation related to a specific resource area. Federal regulation can oversee issues such as the environment, energy, waterways, and fisheries. Associated agencies include USFWS, Reclamation, NMFS, USEPA, NRCS, USACE, U.S. Forest Service (USFS), USGS, and the Western Area Power Administration (WAPA).

The following federal regulation is applicable to public services and utilities, but is discussed in another section of this chapter, as indicated in parentheses:

- Americans with Disabilities Act (Recreation Resources)

4.25.1.1 Critical Infrastructure Information Act of 2002

The Critical Infrastructure Information Act (CIIA) is a component of the Homeland Security Act of 2002, which specifically addresses protection of high risk targets. The CIIA requires the Department of Homeland Security to evaluate and protect critical infrastructure including food and water systems, agriculture, health systems, emergency services, information and telecommunication, banking and finance, energy, transportation, chemical and defense industries, and national monuments and icons. The CIIA exempts disclosure of information regarding critical infrastructure from Freedom of Information Act requests due to the Homeland Security Act.

4.25.1.2 National Fire Protection Association 1710 Standard

This standard contains minimum requirements relating to the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by substantially all-career fire departments[37]. The requirements address functions and objectives of fire department emergency service delivery, response capabilities, and resources. This standard also contains general requirements for managing resources and systems, such as health and safety, incident management, training, communications, and pre-incident planning. This standard addresses the strategic and system issues involving the organization, operation, and deployment of a fire department and does not address tactical operations at a specific emergency incident.

The National Fire Protection Association 1710 Standard recommends a response time of six minutes or less for 90 percent of the time for initial fire suppression and/or emergency medical response. This takes into account dispatch time (one minute), turnout time (one minute), and travel time (four minutes).

4.25.2 State Plans, Policies, and Regulations

4.25.2.1 Health and Safety Code Sections 13000 et seq.

State fire regulations are set forth in Sections 13000 et seq. of the California Health and Safety Code, and include regulations for building standards (as also set forth in the CBC), fire protection and notification systems, fire protection devices such as extinguishers and smoke alarms, high-rise building and childcare facility standards, and fire suppression training.

4.25.2.2 Health and Safety Code Section 13145 and 13146

The Department of Forestry and Fire Protection (CAL FIRE) provides wildland fire protection and implements the State Fire Marshal’s regulations. The State Fire Marshal is apart from CAL FIRE executive staff. California Health and Safety Code Section 13145 and 13146 authorizes, with some exceptions, local fire chiefs, or their designees, to enforce State Fire Marshal regulations.

Section 13145 states that the State Fire Marshal, the chief of any city, county, or city and county fire department or district providing fire protection services, or a Designated Campus Fire Marshal, and their authorized representatives, shall enforce in their respective areas building standards relating to fire and panic safety adopted by the State Fire Marshal and published in the California Building Standards Code and other regulations that have been formally adopted by the State Fire Marshal for the prevention of fire or for the protection of life and property against fire or panic.

Section 13146 states that the responsibility for enforcement of building standards adopted by the State Fire Marshal and published in the California Building Standards Code relating to fire and panic safety and other regulations of the State Fire Marshal shall be as follows:

(a) The city, county, or city and county with jurisdiction in the area affected by the standard or regulation shall delegate the enforcement of the building standards relating to fire and panic safety and other regulations of the State Fire Marshal as they relate to R-3 dwellings, as described in Section 1201 of Part 2 of the California Building Standards Code, to either of the following:

  (1) The chief of the fire authority of the city, county, or city and county, or his or her authorized representative.

[37] A department comprised 100 percent of career firefighters.

(2) The chief building official of the city, county, or city and county, or his or her authorized representative.

(b) The chief of any city, county, or city and county fire department or of any fire protection district, and their authorized representatives, shall enforce within its jurisdiction the building standards and other regulations of the State Fire Marshal, except those described in subdivision (a) or (d).

(c) The State Fire Marshal shall have authority to enforce the building standards and other regulations of the State Fire Marshal in areas outside of corporate cities and districts providing fire protection services.

(d) (d) The State Fire Marshal shall have authority to enforce the building standards and other regulations of the State Fire Marshal in corporate cities and districts providing fire protection services upon request of the chief fire official or the governing body.

(e) The State Fire Marshal shall enforce the building standards and other regulations of the State Fire Marshal on all University of California campuses and properties administered or occupied by the University of California. For each university campus or property the State Fire Marshal may delegate that responsibility to the person of his or her choice who shall be known as the Designated Campus Fire Marshal.

(f) Any fee charged pursuant to the enforcement authority of this section shall not exceed the estimated reasonable cost of providing the service for which the fee is charged, pursuant to Section 66014 of the Government Code.

4.25.2.3 Health and Safety Code, Section 13801 et seq.

Fire districts are formed and regulated pursuant to the California Health and Safety Code, Section 13801 et seq., also known as the Fire Protection District Law of 1987. The enabling legislation authorizes fire districts to provide fire protection, ambulance, and rescue services. Recognizing that the State's communities have diverse needs and resources, it was the intent of the Legislature in enacting this law to provide a broad statutory authority for local officials.

4.25.2.4 California Government Education Code Section 17620(a)

The governing board of any school district is authorized to levy a fee, charge, dedication, or other requirement against any construction within the boundaries of the district, for the purpose of funding the construction or reconstruction of school facilities.

4.25.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to public services and utilities, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.26 Chapter 30: Visual Resources

4.26.1 Federal Plans, Policies, and Regulations

4.26.1.1 National Scenic Byways Program

The National Scenic Byways Program is part of the U.S. Department of Transportation, FHWA. The program is a grass-roots collaborative effort established to help recognize, preserve and enhance selected roads throughout the United States. Since 1992, the National Scenic Byways Program has funded 3,049 projects for State and nationally designated byway routes in 50 states, Puerto Rico, and the District of Columbia. The U.S. Secretary of Transportation recognizes certain roads as All-American Roads or National Scenic Byways based on one or more archeological, cultural, historic, natural, recreational, and scenic qualities.

4.26.2 State Plans, Policies, and Regulations

The following State regulation is applicable to visual resources, but is discussed in another section of this chapter, as indicated in parentheses:

- Delta Protection Act of 1992 (Surface Water Resources)

4.26.2.1 California Scenic Highway Program

The stated intent of the California Scenic Highway Program (Streets and Highways Code Sections 260 to 263) is to protect and enhance the natural scenic beauty of California's highways and adjacent corridors, through special conservation treatment. Official designation requires a local governing body to enact a Corridor Protection Program that protects and enhances scenic resources along the highway. A properly enforced program can:

- Protect the scenic corridor from encroachment of incompatible land uses such as junkyards, dumps, concrete plants, and gravel pits.
- Mitigate activities within the corridor that detract from its scenic quality by proper siting, landscaping, or screening.
- Prohibit billboards and regulate on-site business signs so that they do not detract from scenic views.
- Make development more compatible with the environment and in harmony with the surroundings.
- Regulate grading to prevent erosion and cause minimal alteration of existing contours and to preserve important vegetative features along the highway.
- Preserve views of hillsides by minimizing development on steep slopes and along ridgelines.
- Prevent the need for noise barriers (sound walls) by requiring a minimum setback for residential development adjacent to a scenic highway.

4.26.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to visual resources, but are discussed in other sections of this chapter, as indicated in parentheses:

- Tehama County General Plan (Land Use)
- Glenn County General Plan (General)
- Colusa County General Plan General)

4.27 Chapter 31: Power Production and Energy

4.27.1 Federal Plans, Policies, and Regulations

The following federal regulation is applicable to power production and energy, but is discussed in another section of this chapter, as indicated in parentheses:

- Clean Air Act (Air Quality)

4.27.1.1 Federal Power Act of 1920

The Federal Power Act (16 U.S.C. 791 to 828c; Chapter 285, June 10, 1920; 41 Stat. 1063) (FPA) was first passed in 1920 and has undergone several major amendments since. The FPA governs all interstate power and transmission system transactions, and it established FERC (originally called the Federal Power Commission) to regulate the interstate wholesale transmission market and to license all non-federal hydroelectric projects.

4.27.1.2 Public Utility Regulatory Policies Act of 1978

The Public Utility Regulatory Policies Act (PURPA) established an independent electric generator market, allowing non-utility companies to build power plants and obligating utilities to purchase renewable and higher efficiency power and energy from independent producers at the price it would otherwise cost the utility to produce the power and energy itself, based on its “avoided cost.” This act was largely responsible for the development of the renewable energy industry in the U.S. for the next 25 years.

4.27.1.3 Electric Consumers Protection Act of 1986

The Electric Consumers Protection Act of 1986 specifies that in addition to the power and development purposes for which licenses are issued, FERC shall give “equal consideration” to power and water facility development, energy conservation, recreational uses, and protection, mitigation of damage to and enhancement of fish and wildlife (including spawning grounds and habitat) as well as preservation of other aspects of environmental quality (16 U.S.C. 797(f)).

4.27.1.4 Energy Policy Acts of 1992 and 2005

The Energy Policy Acts established open access requirements for all transmission system owners and gave authority to FERC to mandate construction of new facilities to accommodate all access requests that are in the public’s interest. The 1992 Act amended Section 211 of the FPA (16 U.S.C. 824j) subsection (a) to read: “Any electric utility, federal power marketing agency, or any other person generating electric energy for sale or resale, may apply to the Commission for an order under this subsection requiring a transmitting utility to provide transmission services (including any enlargement of transmission capacity necessary to provide such services) to the applicant…[and that] the Commission may issue such order if it finds that such order meets the requirements of Section 212, and would otherwise be in the public interest." The Act specifies that the costs of such improvements can be recovered through the provider's rates and tariffs, but that "such rates, charges, terms, and conditions shall promote the economically efficient transmission and generation of electricity and shall be just and reasonable, and not unduly discriminatory or preferential."

The 2005 act authorized FERC to certify a national electric reliability organization to enforce mandatory reliability standards for the bulk-power system, under which the Western Electricity Coordinating Council has authority through the North American Electric Reliability Council and, ultimately, FERC to enforce electric reliability standards for bulk power transactions on the interconnected transmission system in the western half of North America. The 2005 act further strengthened transparency in the wholesale power market by granting FERC the authority to publish power, energy and interstate transmission service prices, and gave FERC approval authority over the sale or merger of entities under its jurisdiction greater than $10 million in value.

The 2005 act also repealed the requirement under PURPA that utilities must purchase power from all qualifying facilities and small power producers at a rate based on the utilities' avoided cost, providing FERC finds that a competitive electricity market exists and a qualifying facility has adequate access to wholesale markets; and it repealed the Public Utility Holding Company Act of 1935, which restricted the structure of holding companies of investor-owned utilities, but mandated that utilities give access to their books and records to FERC and State utility regulators.

4.27.2 State Plans, Policies, and Regulations

The following State regulations are applicable to power production and energy, but are discussed in other sections of this chapter, as indicated in parentheses:

- California Global Warming Solutions of 2006 (Climate Change and Greenhouse Gas Emissions)
- California Clean Air Act (Air Quality)
- California Renewables Portfolio Standard Program (Climate Change and Greenhouse Gas Emissions)

4.27.2.1 Warren-Alquist State Energy Resources Conservation and Development Act

The Warren-Alquist State Energy Resources Conservation and Development Act, also called the Warren-Alquist Act, was passed in 1974. The Warren-Alquist Act established the CEC and granted it statutory authority.

4.27.2.2 The Electric Utility Industry Restructuring Act of 1996 (Assembly Bill 1890)

AB 1890 attempted to establish a direct access market for all customers of the investor-owned utilities (IOUs) in the State, allowing customers to purchase energy services from other utilities or third-party providers. It established the Power Exchange, through which all IOUs purchased all power and energy services on the day-ahead and day-of market, and established the Independent System Operator (ISO) as the operator of the State's privately owned transmission system, which includes contracting for various reliability services to maintain required reliability standards. The attempt failed, and the direct access and Power Exchange provisions were repealed later in 2001, but the California ISO still maintains operational control of the interconnected IOU transmission system, including contracting of reliability services, as well as conducts planning for transmission system improvements.

4.27.2.3 California Integrated Energy Policy of 2002 (SB 1389)

SB 1389 requires the CEC to conduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices. These assessments and forecasts will be used by the CEC to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the State's economy, and protect public health and safety.

4.27.2.4 California Clean Water Act 316(b) Once-Through Cooling Policy

On May 4, 2010, the SWRCB adopted a Policy regarding the Use of Coastal and Estuarine Waters for Power Plant Cooling (Policy). The administrative record for the Policy was approved by the Office of Administrative Law on September 27, 2010. The Policy became effective on October 1, 2010 when the California Environmental Quality Act Notice of Decision was submitted to the Secretary of Resources.

The Policy establishes technology-based standards to implement federal Clean Water Act §316(b) and reduce the harmful effects associated with cooling water intake structures on marine and estuarine life. The Policy applies to the 19 existing power plants (including two nuclear plants) that currently have the ability to withdraw over 15 billion gallons per day from the State's coastal and estuarine waters using a single-pass system, also known as once-through cooling. Closed-cycle wet cooling has been selected as Best Technology Available. Permittees must either reduce intake flow and velocity or reduce impacts to aquatic life comparably by other means.

The Policy is implemented through an adaptive management strategy by which the standards can be achieved without disrupting the critical needs of the State's electrical generation and transmission system. A Statewide Advisory Committee on Cooling Water Intake Structures has been established to review implementation plans and schedules and provide recommendations to the SWRCB at least annually. The SWRCB will consider the Statewide Advisory Committee's recommendations and make modifications to the Policy, as appropriate. The permittees' NPDES permits will be reissued or modified to conform with the Policy.

4.27.3 Regional and Local Plans, Policies, and Regulations

The following local regulations are applicable to power production and energy, but are discussed in other sections of this chapter, as indicated in parentheses:

- Glenn County General Plan (General)
- Colusa County General Plan (General)

4.27.3.1 Regional Clean Air Incentives Market (RECLAIM) Program for NO_x and SO_x of 1993

RECLAIM is a market incentive program designed to allow facilities flexibility in achieving emission reduction requirements for oxides of nitrogen (NOx), and oxides of sulfur (SOx) pursuant to the Air Quality Management Plan using methods which include, but are not limited to: add-on controls, equipment modifications, reformulated products, operational changes, shutdowns, and the purchase of excess emission reductions.

4.28 Chapter 34: Growth-Inducing Impacts

4.28.1 Federal Plans, Policies, and Regulations

4.28.1.1 National Environmental Policy Act Regulations

The CEQ regulations require an EIS to consider indirect effects of a project, which are often related to growth-inducing effects (40 CFR 1508.8(b)), as described below:

> *"Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."*

4.28.2 State Plans, Policies, and Regulations

4.28.2.1 California Environmental Quality Act Guidelines

CEQA Guidelines (§15126.2(d)) require that an EIR evaluate the growth-inducing impacts of a project. The EIR must:

> *"Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a waste water treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects."*

> *"Discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment."*

5. Guide to the Resource Analyses

5.1 Introduction

This chapter is included to help readers understand how the impact analyses are presented for the resource discussions in Chapters 6 through 31. The resource chapters included in this EIR/EIS were prepared by a multi-discipline team of resource specialists using data from site visits, field surveys, and technical studies conducted for the Project; and information obtained from published environmental and planning documents, books, websites, journal articles, and communications with technical experts.

Chapters 6 through 31 of this EIR/EIS are organized by environmental resource area. Each chapter discusses the Environmental Setting[1]/Affected Environment[2], the Environmental Impacts[1]/Environmental Consequences[2] (short- and long-term impacts/direct and indirect impacts,) of implementing the No Project[1]/No Action[2] Alternative and the three action alternatives (Alternatives A, B, and C), and, where appropriate, Mitigation Measures. Also discussed for each environmental resource area are the assumptions considered and methodologies used, the regulatory setting, and the references that were consulted during the preparation of the resource analyses.

Chapters 6 through 31 are organized into the following resource areas:

- Chapter 6: Surface Water Resources
- Chapter 7: Surface Water Quality
- Chapter 8: Fluvial Geomorphology and Riparian Habitat
- Chapter 9: Flood Control and Management
- Chapter 10: Groundwater Resources
- Chapter 11: Groundwater Quality
- Chapter 12: Aquatic Biological Resources
- Chapter 13: Botanical Resources
- Chapter 14: Terrestrial Biological Resources
- Chapter 15: Wetlands and Other Waters of the U.S.
- Chapter 16: Geology, Minerals, Soils, and Paleontology
- Chapter 17: Faults and Seismicity
- Chapter 18: Cultural Resources
- Chapter 19: Indian Trust Assets
- Chapter 20: Land Use
- Chapter 21: Recreation Resources
- Chapter 22: Socioeconomics
- Chapter 23: Environmental Justice
- Chapter 24: Air Quality
- Chapter 25: Climate Change and Greenhouse Gas Emissions
- Chapter 26: Navigation, Transportation, and Traffic
- Chapter 27: Noise
- Chapter 28: Public Health and Environmental Hazards
- Chapter 29: Public Services and Utilities

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[1] This terminology is applicable to the California Environmental Quality Act (CEQA).
[2] This terminology is applicable to the National Environmental Policy Act (NEPA).

- Chapter 30: Visual Resources
- Chapter 31: Power Production and Energy

For some of these resource areas, an appendix has been prepared. All appendixes are listed in the EIR/EIS Table of Contents, and are included at the end of this EIR/EIS.

5.1.1 Approach to the Resource Analyses

5.1.1.1 CEQA and NEPA Requirements

The California Environmental Quality Act (CEQA) and the State *CEQA Guidelines* §15125(a) indicate that "the description of the environmental setting shall be no longer than is necessary to an understanding of the significant effects of the proposed project and its alternatives."

CEQA Guidelines §15126 indicates that "all phases of a project must be considered when evaluating its impact on the environment: planning, acquisition, development, and operation". *CEQA Guidelines* §15126.2(a) indicates that "an EIR shall identify and focus on the significant environmental effects of the proposed project. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. State *CEQA Guidelines* §15126.4 requires that an EIR describe feasible measures which could minimize significant adverse impacts, and sets forth mitigation measure considerations.

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) specify that an "EIS shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses in a statement shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced" (Title 40, Section 1502.15 of the Code of Federal Regulations [40 CFR 1502.15]).

40 CFR 1502.16 indicates that, for the environmental consequences analysis, "the discussion will include the environmental impacts of the alternatives including the proposed action." It shall include "any environmental effects which cannot be avoided should the proposal be implemented." It shall also include discussions of: direct effects and indirect effects and their significance; possible conflicts between the proposed action and the objectives of federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies, and controls for the area concerned; and the means to mitigate adverse environmental impacts. "40 CFR 1502.14(f) requires the inclusion of "appropriate mitigation measures not already included in the proposed action or alternatives".

DWR and Reclamation prepared this EIR/EIS in accordance with the above-listed regulations.

5.1.1.2 Establishment of the Environmental Setting/Affected Environment Baseline Date

In determining the "Environmental Setting/Affected Environment " baseline date for environmental analyses in this EIR/EIS, DWR and Reclamation consulted the *CEQA Guidelines* and the CEQ NEPA regulations (40 CFR Part 1500).

CEQA Guidelines §15125(a) indicates than "an EIR must include a description of the physical environmental conditions in the vicinity of the project as they exist at the time the Notice of Preparation

(NOP) is published, or if no NOP is published, at the time environmental analysis is commenced, from both a local and regional perspective. The environmental setting will normally constitute the baseline physical conditions by which a Lead Agency determines whether an impact is significant.

CEQA Guidelines §15126.2(a) indicates that “the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the NOP is published, or where no NOP is published, at the time environmental analysis is commenced.”

The CEQ regulations do not specify a baseline physical condition time period.

The NOP for the Project was published on November 5, 2001, and the Notice of Intent (NOI) for the Project was published on November 9, 2001. Lead agencies have the discretion, where appropriate, to fully or partially update baseline physical conditions beyond the time of the issuance of the NOP and NOI. Because the preparation of this environmental document has occurred over several years, it is appropriate to delay the Environmental Setting/Affected Environment date to include programs, projects, or policies that have been implemented during the document’s preparation. Changes in the regulatory environment since November 2001, such as the regulations discussed below, preclude using November 2001 as the baseline for environmental analyses in this EIR/EIS.

The December 2008 U. S. Fish and Wildlife Service (USFWS) and June 2009 National Marine Fisheries Service (NMFS) Biological Opinions (BOs) for the Operations Criteria and Plan (OCAP) established a new regulatory framework for water management and operations within the Sacramento Valley and the Sacramento-San Joaquin Delta. These BOs fundamentally changed State and federal project operations, which affected water supply reliability and substantially increased water supplies dedicated to environmental enhancement purposes. For these reasons, June 2009 (following the release of NMFS’ BO) was selected as the Project’s Environmental Setting/Affected Environment (i.e., Existing Conditions) date.

The environmental and social conditions in June 2009 within the Project’s three study areas[3] that could be affected by the three action alternatives were used to establish the Environmental Setting/Affected Environment that is presented in each of the environmental resource evaluations (Chapters 6 through 31). The information necessary to characterize the setting was obtained from technical studies performed for the Project, information that was obtained from published environmental and planning documents, books, websites, journal articles, field surveys, site visits, and communications with technical experts. In addition, the resources analyses considered regulations that are in effect; descriptions of the regulations for each resource are provided in Chapter 4 Environmental Compliance and Permit Summary.

[3]The three study areas for the EIR/EIS analyses are the Extended, Secondary, and Primary study areas. They are discussed in Chapter 1 Introduction. The data presented in the various resource chapters for the three study areas were presented at a level of detail that was appropriate for each individual discussion.

5.1.1.3 Project Facilities Evaluated

Analysis of the action alternatives within each resource area included consideration of each of the following Project facilities that are components of the alternatives:

- Sites Reservoir Inundation Area (1.27-MAF reservoir or 1.81-MAF reservoir)
- Sites Reservoir Dams (Golden Gate Dam, Sites Dam, and saddle dams)
- Recreation Areas (Antelope Island, Lurline Headwaters, Stone Corral, Peninsula Hills, Saddle Dam[4])
- Road Relocations and South Bridge
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- Glenn-Colusa Irrigation District Canal Facilities Modifications
- Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir
- Terminal Regulating Reservoir
- Terminal Regulating Reservoir Pumping/Generating Plant
- Terminal Regulating Reservoir Electrical Switchyard
- Terminal Regulating Reservoir Pipeline
- Terminal Regulating Reservoir Pipeline Road
- Delevan Transmission Line
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard
- Delevan Pipeline Intake Facilities
- Delevan Pipeline Discharge Facility
- Project Buffer

Combinations of these Project facilities were used to create action Alternatives A, B, and C. In the resource chapters, DWR and Reclamation described the potential impacts associated with the construction, operation, and maintenance of each of the Project facilities listed above for each of the three action alternatives.

5.1.1.4 Alternatives Analysis

For this analysis, DWR and Reclamation defined the No Action Alternative as the conditions that existed as of June 2009 (known as the Existing Conditions, and characterized in Chapters 6 through 31 as the Environmental Setting/Affected Environment), plus the programs that were adopted and the facilities that were permitted or are being constructed during the early stages of development of the EIR/EIS. As indicated in Chapter 3, the No Project Alternative (for CEQA) and the No Action Alternative (for NEPA) are the same alternative. Thus, in this EIR/EIS, it is called the No Project/No Action Alternative.

[4] Although five recreation areas were evaluated in this EIR/EIS, fewer than five recreation areas may be developed if the Project is approved.

For every resource discussion presented in Chapters 6 through 31, for the purpose of CEQA compliance:

- The No Project Alternative (CEQA term) was compared to the Environmental Setting (known as Existing Conditions)
- Alternatives A, B, and C were compared to the Environmental Setting (known as Existing Conditions)

For every resource discussion presented in Chapters 6 through 31, for the purpose of NEPA compliance:

- Alternatives A, B, and C were compared to the No Action Alternative (NEPA term).

To reduce redundancy in the analyses of Alternatives A, B, and C, the analysis for Alternative A was presented first in the discussion, and then the analyses for alternatives B and C indicate if their impacts would be the same, or similar to, Alternative A. If they were not similar, those analyses then described how they differed from Alternative A.

The analysis of each resource began with an examination of the Existing Conditions that may be affected by implementation of the alternatives. The effects of the alternatives, pursuant to CEQA, were defined as the changes to Existing Conditions that were attributable to construction, operation, and/or maintenance of the alternatives.

In conducting the analysis for this EIR/EIS, the authors considered the comments that were received during the Project's scoping period, relied on available published studies and reports, and conducted independent investigations, as needed. The specific documents considered and relied upon are cited for each resource in Chapter 37 References.

Each identified impact has been numbered in accordance with the naming convention presented in Table 5-1. Included in each impact discussion is the reasoning indicating *whether* and *why* there would be an impact and the level of significance of each impact, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 5-1
Impact Naming Convention for each of the Resources Evaluated

Resource Area	Impact Numbering*
Surface Water Resources	Impact SW Res-#
Surface Water Quality	Impact SW Qual-#
Fluvial Geomorphology and Riparian Habitat	Impact Geom-#
Flood Control	Impact Flood-#
Groundwater Resources	Impact GW Res-#
Groundwater Quality	Impact GW Qual-#
Aquatic Resources	Impact Aquat-#
Botanical Resources	Impact Bot-#
Terrestrial Biological Resources	Impact Wild-#
Wetlands and Other Waters of the US	Impact Wet-#
Geology, Minerals, Soils, and Paleontology	Impact Geol-#
	Impact Min-#
	Impact Soils-#
	Impact Paleo-#
Faults and Seismicity	Impact Seis-#
Cultural Resources	Impact Cul-#

Table 5-1
Impact Naming Convention for each of the Resources Evaluated

Resource Area	Impact Numbering*
Indian Trust Assets	Impact ITA-#
Land Use	Impact Land-#
Recreation Resources	Impact Rec-#
Socioeconomics	Impact Socio-#
Environmental Justice	Impact Env Jus-#
Air Quality	Impact Air Qual-#
Climate Change and Greenhouse Gas Emissions	Impact Climate-#
	Impact GHG-#
Navigation, Transportation, and Traffic	Impact Trans-#
Noise	Impact Noise-#
Public Health and Environmental Hazards	Impact Pub Health-#
Public Services and Utilities	Impact Services-#
Power Production and Energy	Impact Power-#
Visual Resources	Impact Visual-#

*Each resource impact is numbered, with the first impact numbered “1”.

5.1.1.5 Types of Impacts

Mechanisms that could cause impacts are discussed for each resource. General categories of impact mechanisms are construction and future operation and maintenance. Project-related impacts are categorized as follows, to describe the intensity or duration of the impact:

- **A temporary impact** would last less than three to four years and typically would occur only during Project construction. Construction impacts would occur during the defined construction period and include all activities that would occur to construct each Project facility. For the purposes of this analysis, the initial filling of Sites Reservoir and Project access road construction was considered a construction-related impact. The construction disturbance area includes each Project facility footprint plus the land area around that footprint that would be used for materials laydown, soil stockpiling, equipment storage, construction vehicle parking, equipment/vehicle maintenance, spoil disposal, construction debris, batch plants, materials delivery, access roads, actual construction activity disturbance, and any other activity conducted during the construction period for a Project purpose that would cease after the Project facilities are built. The total construction disturbance area is larger than the permanent long-term disturbance area that is caused by each Project facility footprint.
- **A short-term impact** would occur during Project construction and could last from the time construction ceases to within three to five years after Project construction.
- **A long-term impact** would last longer than five years after the completion of Project construction. In some cases, a long-term impact could be a permanent impact. Project operational and maintenance impacts include any activities that must occur to operate and maintain each Project facility. These activities and their associated impacts are long-term and permanent. Operation activities include those related to the movement of water (such as Sites Reservoir level fluctuations, or the intake or release of water through the Delevan Pipeline Intake or Discharge facility), the generation/transmission of electricity, the use of roads during operation and maintenance activities, and the recreation activities that would be associated with operation of the reservoir. Maintenance activities include the upkeep of all of the facilities.

- **A direct impact** is an impact that would be caused by an action and would occur at the same time and place as the action.
- **An indirect impact** is an impact that would be caused by an action but would occur later in time or at another location, yet is reasonably foreseeable in the future.

5.1.1.6 Determination of Significance of Impacts

CEQA Guidelines §15382 define the term "significant effect on the environment" as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance." The *CEQA Guidelines* further state that the determination of whether a project could have a significant effect on the environment requires careful judgment on the part of the public agency involved and that this judgment should be based, to the extent possible, on "scientific and factual data" [§15064(b)]. CEQA also states that there is no predetermined definition of "significant effect" because the significance of an activity can vary with the setting. For example, an activity that might not have a significant effect in an urban area could be considered significant in a rural area [§15064(b)].

For the purposes of the analyses conducted in this EIR/EIS of Alternatives A, B, and C, a combination of the CEQA Appendix G Environmental Checklist Form criteria were used, along with professional judgment that considered current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. The specific criteria for determining impact significance are listed within the impact discussion in each resource chapter.

The level of significance of the impacts for Alternatives A, B, and C was classified based on the following impact definitions:

- **Potentially Beneficial Effect:** The alternative would potentially improve the environment. No mitigation is required.
- **Beneficial Effect:** The alternative would improve the environment. No mitigation is required.
- **No Impact:** No change in the environment would result from implementing the alternative. No mitigation is required.
- **Less-than-Significant Impact:** No substantial adverse change in the environment would result from implementing the alternative. No mitigation is required.
- **Potentially Significant Impact:** A substantial adverse change in the environment may result from implementing the alternative; however, additional information is needed regarding the extent of the impact. For CEQA purposes, a potentially significant impact is treated as if it were a significant impact. Mitigation measures are identified, when feasible, to reduce effects to the environment.
- **Significant Impact:** A substantial adverse change in the physical conditions of the environment would result from implementing the alternative. Significant impacts are identified by the evaluation of project effects using specified significance criteria. Mitigation measures are identified, when feasible, to reduce effects to the environment.

5.1.1.7 Mitigation Measure Development and Implementation

Mitigation measures were presented, where feasible, to avoid, minimize, rectify, reduce, or compensate for significant and potentially significant impacts of the alternatives, in accordance with §15126.4 of the *CEQA Guidelines* and NEPA regulations (40 CFR 1508.20). To aid the reader, each mitigation measure was identified numerically to correspond with the number of the impact being mitigated by the measure.

When “significant” or “potentially significant” impacts were identified, feasible mitigation measures were formulated to eliminate or reduce the intensity of the impacts and focus on the protection of sensitive resources. The effectiveness of a mitigation measure was subsequently determined by evaluating the impact remaining after the application of the mitigation, and reaching one of two conclusions: (1) the mitigation reduced the impact to a less-than-significant level; or (2) no feasible mitigation exists to reduce the impact to a “less-than-significant level,” and therefore, the impact was determined to be “significant and unavoidable”. No mitigation measures were needed or proposed when an impact was determined to be “less than significant.” Implementation of more than one mitigation measure may be needed to reduce an impact below a level of significance. The mitigation measures recommended in this EIR/EIS are identified within each resource chapter (Chapters 6 through 31) and are presented in the Mitigation Monitoring Plan (Appendix 1A).

5.1.1.8 Topics Eliminated from Further Analytical Consideration

CEQA and the State *CEQA Guidelines* provide for the identification and elimination from detailed study the effects that are not significant or that have been covered by prior environmental documentation (Public Resources Code, §21002.1; State *CEQA Guidelines*, §15143). The NEPA regulations provide similar provisions (40 CFR 1501.7(a)(3)).

During initial scoping with the public and governmental agencies, and based on information obtained through literature review, agency correspondence, consultations, and field data collection, it was determined that no resources were able to be eliminated from detailed study. Therefore, analysis of all resources required by CEQA and NEPA is included in this Draft EIR/EIS.

However, during preparation of the impact analyses, it became evident that some of the CEQA significance criteria were not applicable to the Project, or that some discussions were not relevant to the analysis. DWR and Reclamation described those situations in a “Topics Eliminated from Further Analytical Consideration” subsection in the appropriate resource chapters.

5.1.1.9 Tools, Analytical Methods, and Applications

Each resource chapter includes a description of the methodology used to identify and assess the potential environmental impacts that would result from implementation of the alternatives. For those resources that used modeling output, a brief overview of the modeling tools and output is provided below.

Several modeling tools and analytical methods were used to characterize and analyze the changes in water operations in the SWP and CVP systems for each alternative. These tools represent the best available technical tools for purposes of conducting the analyses. The overall flow of information between the models and the general application and use of output for the resource evaluations are shown in Figure 5-1. Table 5-2 provides a description of the various modeling tools and an overview of how they were used for the impact analyses.

The models were used to compare and contrast the effects among alternatives with various operating scenarios. The models incorporated a set of base assumptions; the assumptions were then modified to reflect the operations associated with each of the alternatives. The output of the models was used to show the comparative difference in the conditions among the different alternative scenarios. The model output does not predict absolute conditions in the future; rather, the output is intended to show what type of changes would occur. This type of model is described as comparative rather than predictive. Because of the comparative nature of these models, these results are best interpreted using various statistical measures, such as long-term and water year-type averages, and probability of exceedance.

The output from these models supports the comparative analysis of various resources, such as water quality, land use, economics, and energy. Additional detailed discussions of the modeling tools and assumptions are provided in the appendixes that are mentioned in Table 5-2.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
Surface Water Resources	
SWP and CVP Hydrology and System Operations Model (CALSIM II)	Simulates operations of the SWP, CVP, and other facilities in the Central Valley and approximates changes in storage reservoirs, river flows, and exports from the Delta. Inputs describe assumptions of hydrology at projected levels of land and water use, existing and proposed facilities, and riverine and Delta regulatory conditions. SWP and CVP operations are consistent with the Biological Assessment on the Continued Long-term Operations of the Central Valley Project and the State Water Project (U.S. Bureau of Reclamation. 2008) as modified by the December 2008 USFWS BiOp (U.S. Fish and Wildlife Service. 2008) and the June 2009 NMFS BiOp (National Marine Fisheries Service. 2009). The model and assumptions are described in Appendixes 6A and 6B.
Artificial Neural Network (ANN)	Mimics the flow-salinity relationships as modeled in the Delta Hydrodynamics and Salinity Model (DSM2), and provides a rapid transformation of this information into a form usable by the Statewide CALSIM II model. ANN is implemented in CALSIM II to inform the operations of the upstream reservoirs and the Delta export pumps to satisfy particular salinity requirements.
Upper Sacramento River Daily Operations Model (USRDOM)	Simulates daily reservoir operations and daily river flows for the upper Sacramento River from Shasta Dam to Knights Landing, including the facilities and tributaries within this region; includes the Trinity River section of the Central Valley Project, the Sutter Bypass region (and other bypasses), and the conveyance and storage facilities of the proposed Project. Uses CALSIM II outputs. The model is described in Appendix 6C.
Surface Water Quality	
Upper Sacramento River Water Quality Model (USRWQM)	Simulates the temperature regime of the Upper Sacramento River. The USRWQM, as modified for use in the NODOS Investigations, extends from Keswick Dam to Knights Landing and includes the Sacramento River, Sacramento River at Red Bluff Diversion Dam, Black Butte Dam, Stony Creek, T-C Canal, GCID Canal, Colusa Basin Drain, a proposed Delevan pipeline, the proposed Holthouse Reservoir, and the proposed Sites Reservoir. Provides estimate of daily average riverine temperature conditions. Uses USRDOM outputs. The model is described in Appendix 7E.
Preliminary Sites Reservoir Discharge Temperature Model	Simulates the temperature regime in the proposed Sites Reservoir and the discharge of flows to the Sacramento River. Provides simulated daily average temperature conditions of discharge and blended flow in the Sacramento River. Uses USRDOM and USRWQM outputs. The model is described in Appendix 7E.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
Reclamation Monthly Temperature Models (Reclamation Temperature)	Simulates the temperature regime in the Trinity, Feather, American, Lower Sacramento, and Stanislaus river basins and upstream reservoirs. Provides simulated monthly reservoir and stream temperatures used for evaluating the effects of operations on mean monthly water temperatures in the basin. Uses CALSIM II outputs. The model is described in Appendix 7E.
Delta Hydrodynamics Model (DSM2 HYDRO)	Simulates one-dimensional hydrodynamics of the Sacramento–San Joaquin Delta; models Delta channel flows, stages, and cross-section average velocities under tidal conditions. DSM2 is simulated on a 15-minute time step to address the changing tidal dynamics of the Delta system; however, one-dimensional and simplified boundary conditions limit use of results to monthly statistics. Uses outputs from CALSIM II. The model is described in Appendix 7D.
Delta Salinity Model (DSM2 QUAL)	Simulates salinity based on Electrical Conductivity (EC) calibration; one-dimensional and simplified boundary conditions limit use of results to monthly statistics. Uses outputs from DSM2 HYDRO. The model is described in Appendix 7D.
Fluvial Geomorphology and Riparian Habitat, Botanical Resources, and Terrestrial Biological Resources	
Sedimentation and River Hydraulics - Capacity (SRH-Capacity)	Simulates water and sediment budgets of the river system at the watershed scale. The model links sediment sources and transport with geomorphic change and accounts and predicts the sediment loads from tributaries and sediment balance in the main stem of the river. The study area is the Sacramento River from River Mile 295 (downstream of Keswick Dam) to River Mile 80 (near Knights Landing). The study area has been divided into 23 sub-reaches based on hydraulic conditions and river slope. Hydraulics conditions are averaged in each reach and then transport capacity in each reach is computed using the sediment size fraction. SRH-Capacity uses daily flow data from 19 tributaries and computes sediment load in these reaches to estimate sediment balance in the mainstem. Uses outputs from USRDOM. The model is described in Appendix 8A.
Sedimentation and River Hydraulics – Meander (SRH-Meander)	Simulates the bed topography, flow field, and bank erosion rate in curved channels with an erodible bed. In each time step, SRH-Meander first calculates the flow field. It then computes the channel bank erosion rate. Finally, the channel alignment is updated with the erosion rate, followed by a channel cutoff if needed. The model can be used to predict the channel migration in meandering rivers. Uses outputs from USRDOM. The model is described in Appendix 8A.
Sedimentation and River Hydraulics - Vegetation (SRH-1DV)	Simulates river hydraulics, sediment transport, erosion, deposition, and vegetation growth. Cottonwood growth and survival at different cross-sections along the Sacramento River is simulated between Keswick Dam and Colusa. The river is divided into five reaches. SRH-1DV uses groundwater data at several locations and river stage data at River Mile 183 and River Mile 193. Flow rates for the model are required at Hamilton City and Ord Ferry. Uses outputs from USRDOM. The model is described in Appendix 8A.
Riparian Habitat Establishment Model (RHEM)	Simulates the growth of riparian vegetation on point bars. Integrates the simultaneous effects of river stage, precipitation, evaporation, and plant transpiration on soil water content in the root zone. Uses these results to determine the plant survival by simulating the plant's ability to maintain sufficient transpiration to support continued root and shoot growth from germination through the initial establishment stage. Uses outputs from USRDOM and SRH. The model is described in Appendix 8A.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
Sacramento River Ecological Flows Tool (SacEFT)	A decision analysis tool that incorporates physical models of the Sacramento River with biophysical habitat models for three species that use riparian habitats along the Sacramento River to evaluate the ecological consequences of management-related changes in flow regime and channel restoration activities. Includes flow and habitat relationships for bank swallows and channel erosion/migration for large woody debris deposition and removal, western pond turtle, and Fremont cottonwood. The model is described in Appendix 8B.
Aquatic Biological Resources	
Reclamation Mortality Models (Reclamation Mortality and SacSalMort)	Estimates the fraction of population lost each year for winter-, spring-, fall-, and late-fall-run Chinook salmon due to thermal conditions only. Uses reach level empirical degree-day equations for the Trinity, Sacramento, Feather, American, and Stanislaus rivers. Uses monthly average outputs from Reclamation Temperature Model. Customized version for the Sacramento River (SacSalMort) uses daily outputs from USRWQM. The model is described in Appendix 12J.
Salmonid Population Model (SALMOD)	Simulates dynamics of freshwater life history of anadromous and resident salmonid populations using streamflow, water temperature, and habitat type. Provides potential fish production values reflecting the suitability of riverine habitat for winter-, spring-, fall-, and late-fall-run Chinook salmon. Simulates salmon habitat conditions in the Sacramento River between Keswick Dam and Bend Bridge. Uses outputs from USRDOM and USRWQM. The model is described in Appendix 12K.
Winter Run Chinook Life Cycle Model (IOS)	Simulates multiple life stages of winter-run Chinook salmon within the Sacramento River system. Life-cycle model provides a quantitative framework to evaluate the effects of flow, temperature, diversions, and habitat conditions on individual cohorts and overall population of winter-run Chinook salmon. The IOS model tracks daily salmon numbers from six different life stage categories (eggs, alevins, fry, smolts, subadults, and adults). The model is spatially explicit including detailed reaches of the Sacramento River, Delta migratory corridors, and the Pacific Ocean. Uses outputs from USRDOM, USRWQM and DSM2. The model is described in Appendix 12L.
Delta Passage Model (DPM)	Simulates detailed accounting of migratory pathways and reach-specific mortality for four runs (winter-, spring-, fall-, and late-fall) of Chinook salmon smolts traveling through a simplified network of reaches and junctions in the Delta. The DPM operates on a daily time step using simulated daily average flows and Delta exports as model inputs. The DPM does not attempt to represent sub-daily flows or diel salmon smolt behavior in response to the interaction of tides, flows, and specific channel features. The DPM for winter-run Chinook salmon is incorporated as a module of the IOS model. Uses outputs from DSM2. The model is described in Appendix 12M.
Sacramento River Ecological Flows Tool (SacEFT)	A decision analysis tool that incorporates physical models of the Sacramento River with biophysical habitat models for three Sacramento River fish species to evaluate the ecological consequences of management-related changes in flow regime and channel restoration activities. Includes flow and habitat relationships for Chinook salmon, steelhead, and green sturgeon. Constituent focal species "sub-models" provide performance measures specific to the species evaluated. Multi-year roll-ups of annual performance allow users to quickly zoom in on the much smaller set of performance measures, which differ significantly across management scenarios. Uses outputs from CALSIM II, USRDOM, and USRWQM. For fisheries analyses in the NODOS Investigations, the SacEFT was used to evaluate potential impacts on steelhead and green sturgeon. The model is described in Appendix 8B.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
Recreation Resources	
Recreation-Day Benefit Values	Benefit values combine two equally weighted factors: (1) variety and quality of recreation, and (2) aesthetic qualities of the site. Factors considered in determining the variety and quality of recreation at a reservoir include the types of activities available, quality of the experience, quality of development, and operation and maintenance of the facilities and area. Aesthetic factors include reservoir operation, geologic, topographic, aquatic, vegetative, climate, and other environmental factors. Based on guidelines described in DWR's Economics and Recreation Planning Manuals and in Supplementary Procedures for Application of DWR's Guidelines for Evaluation of General Recreation, developed jointly by DWR and DPR (California State Parks, 1967).
Socioeconomics	
Statewide Agricultural Production (SWAP) model	Simulates the decisions, production, and economics of agricultural producers in California's Central Valley. The model includes up to 27 crop production regions in the Central Valley and 20 categories of crops. Surface water supplies are estimated by hydrologic models and groundwater use and pumping lift are estimated based on assumptions about groundwater availability. SWAP model versions consider responses under average hydrologic conditions and responses during drought. The model maximizes the producer and consumer surplus to determine an optimal market solution. Uses outputs from CALSIM II. The model is described in Appendix 22E.
Least Cost Planning Simulation Model (LCPSIM)	Simulation/optimization model that assesses the economic benefits and costs of increasing urban water service reliability (supply/demand balance) at the regional level. The total cost of the optimized regional water management plan is used in a comparative analysis to determine the potential economic benefit or cost of a proposed action. Models are available for the South Bay and South Coast regions. Uses outputs from CALSIM II. The model is described in Appendix 22D.
Other Municipal Water Economics Model (OMWEM)	Urban water supply valuation for other urban areas using assumptions associated with availability of surface and groundwater supplies. Uses outputs from CALSIM II. The model is described in Appendix 22D.
Lower Colorado River Basin Water Quality Model (LCRBWQM)	Assesses the regional economic effects of water salinity within the SWP system and Colorado River Aqueduct throughout the urban coastal region of southern California. Assesses the benefit of a change in average annual regional salinity costs based on demographic data; water deliveries; TDS concentration; and costs for typical household, agricultural, industrial, and commercial water uses. Uses mathematical functions that define the relationship between TDS and items in each affected category, such as the useful life of appliances, specific crop yields, and costs to industrial and commercial customers. Uses long-term volume and salinity load information based on CALSIM II and DSM2 results. The model is described in Appendix 22E.
Bay Area Water Quality Economics Model (BAWQM)	Assesses the benefit of a change in average annual regional salinity costs based on households in the South Bay region. Uses mathematical functions that define the relationship between TDS and items in each affected category, such as the useful life of appliances. Uses long-term volume and salinity load information based on CALSIM II and DSM2 results. The model is described in Appendix 22E.
IMPLAN	IMPLAN develops input-output estimates of the economic impacts of various activities. For water resources planning, IMPLAN estimates the income and employment effects upon local communities from water project construction and the regional effects of water transfers. Uses outputs from SWAP. The model is described in Appendix 22C.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
Reporting Metrics Tool (RMT)	Developed for the NODOS Feasibility Report and EIR/EIS, RMT is a spreadsheet model that reports system operations and economics metrics. The reports are a summary of system specifications for scenarios evaluated, modeled operations, and modeled economics impacts at a range of detail. The reported system operations metrics include yield and water supply, water quality, and hydropower. The reported economics metrics include Project costs, agricultural and M&I water supply, and M&I water quality. The system operations metrics are characterized by user type, and because the modeled economics metrics do not include the entire modeled operations metrics, extensions are made in the RMT to provide estimates for these reporting gaps. Uses outputs from SWAP, LCPSIM, OMWEM, LCRBWQM, BAWQM and other Project-specific information. The model is described in Appendix 22B.
Air Quality and Greenhouse Gas Emissions	
Off-Road Emissions Model (OFFROAD 2007)	The OFFROAD Model estimates the relative contribution of gasoline-, diesel-, compressed natural gas, and liquefied petroleum gas-powered vehicles to the overall emissions inventory of the state. The model is described in Appendix 24A.
Emissions & Generation Resource Integrated Database (eGRID)	The eGRID is a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States. These environmental characteristics include air emissions for nitrogen oxides, sulfur dioxide, carbon dioxide, methane, and nitrous oxide; emissions rates; net generation; resource mix; and many other attributes. Uses outputs from Reclamation Long Term Generation (LT-GEN), State Water Project Power Model (SWP Power) and Project Power. The model is described in Appendix 24A.
URBan EMISsions (URBEMIS 2007)	URBEMIS 2007 estimates air pollution emissions from a wide variety of land use projects. The model uses the California Air Resources Board's EMFAC2007 model for on-road vehicle emissions and the OFFROAD2007 model for off-road vehicle emissions. The model is described in Appendix 24A.
EMission FACtors (EMFAC 2007)	The EMFAC model is used to calculate emission rates from all motor vehicles, such as passenger cars to heavy-duty trucks, operating on highways, freeways and local roads in California. The model is described in Appendix 24A.
Power Production and Energy	
Reclamation Long Term Generation (LT-GEN)	Computes the power generation and capacity for CVP power plants and project use (pumping plant demand) for CVP pump stations at a monthly time step based on the operations defined by a CALSIM II simulation. Simplified factors are used to separate peak and non-peak generation and load. Includes calculations of transmission losses. Net-revenue is estimated based on price forecasts. Uses outputs from CALSIM II. The model is described in Appendix 31B.
State Water Project Power Model (SWP Power)	Computes the power generation and capacity for SWP power plants and project use (pumping plant demand) for SWP pump stations at a monthly time step based on the operations defined by a CALSIM II simulation. Simplified factors are used to separate peak and non-peak generation and load. Net-revenue is estimated based on price forecasts. Uses outputs from CALSIM II. The model is described in Appendix 31B.
NODOS Power	Computes the power generation and capacity for proposed Project power plants and use (pumping plant demand) for proposed Project pump stations at a monthly time step based on the operations defined by a CALSIM II simulation. Simplified factors are used to separate peak and non-peak generation and load. Net-revenue is estimated based on price forecasts. Uses outputs from CALSIM II. The model is described in Appendix 31B.

Table 5-2
Overview of NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications

Model Name	Description of Model
DWR-PARO Optimization Modeling	A DWR-PARO Power Planning Study was completed to analyze the current/designed components, and operational scenarios of the Project from a power planning perspective. The Study was aimed at optimizing Project operations to maximize its power portfolio's value (revenues-obligations). The Study is implemented using current power market information and regulations, and available power portfolio models/tools to better evaluate energy costs and revenues of the Project. The Study considered short time step pump-generation operations in addition to long-term water operations. Uses outputs from CALSIM II. The model is described in Appendix 31A.

5.1.1.10 Limitations of the Modeling Tools and Analytical Methods

All modeling tools and analytical methods used in the environmental consequences analyses have limitations. The limitations related to the modeling tools are documented in each of the Appendixes referenced in Table 5-2. There are other uncertainties reflected in the EIR/EIS analyses presented in this document from conducting the environmental studies associated with a large, complex, and evolving project over a period of many years. Biological and cultural resource surveys were conducted over a period of many years. These surveys have limitations in that survey access was not obtained for all parcels for all resource surveys. These surveys are adequate for impact assessment, but some surveys may need to be updated to meet regulatory agency guidelines to confirm final mitigation.

5.1.1.11 Sensitivity Analysis

One limitation of the environmental consequences analyses is that the water operations in the SWP and CVP systems for each alternative were evaluated only at the 2009 climate and sea level conditions. A sensitivity analysis was prepared to evaluate the potential impact of climate and sea level conditions on the results of the surface water models, CALSIM II, and test the conclusions of the environmental consequences analyses subject to the findings of this sensitivity analyses (Appendix 25B).

5.2 References

California Department of Parks and Recreation (California State Parks). 1967 (with Revisions to 1971). Water Project Recreation Planning Manual. Measurement of Benefits, Sections 6400-6411.14.

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U.S. Fish and Wildlife Service. 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). December 15. Region 8. Sacramento, CA.

Figure

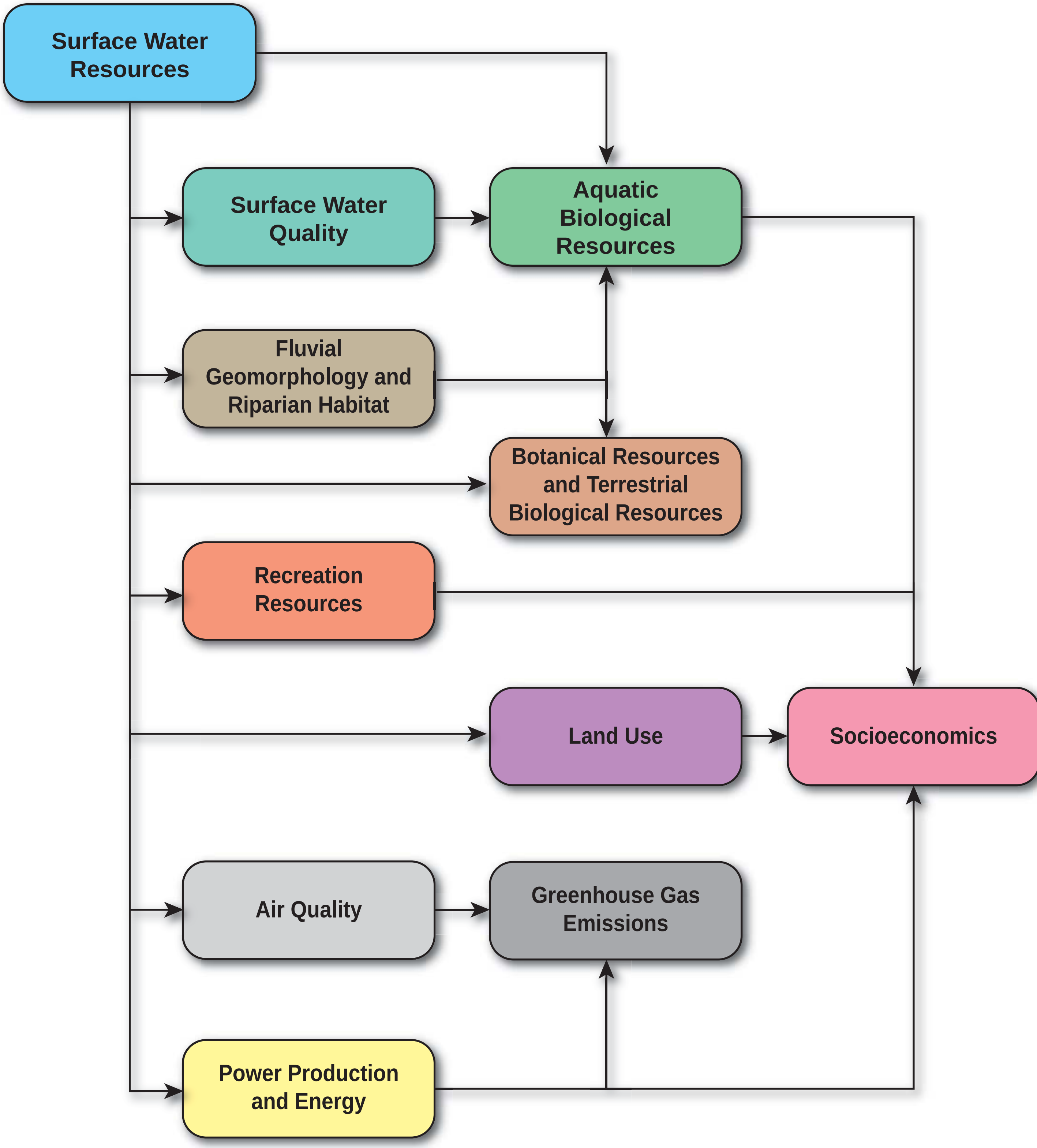

FIGURE 5-1
Overview of Influences between NODOS EIR/EIS Modeling Tools, Analytical Methods, and Applications
North-of-the Delta Offstream Storage Project

6. Surface Water Resources

6.1 Introduction

This chapter describes Existing Conditions (the environmental setting) and Project-related changes to surface water resources in the Extended, Secondary and Primary study areas. Detailed descriptions and maps of these three study areas are provided in Chapter 1 Introduction, and summarized descriptions are included in this chapter. Surface water resources generally include reservoirs, rivers, creeks, and human-made diversions, such as flood bypasses and canals.

The chapter also includes a description of the current and future operations and resulting surface water resources characteristics of California's major water systems that are relevant to the Project: the Central Valley Project (CVP), the State Water Project (SWP), and associated tributary rivers and streams. A schematic showing the layout of these two water systems, with the relative location of the proposed Project, is shown in Figure 6-1. A comparison of these characteristics has been made between Existing Conditions, the No Project/No Action Alternative, and the three action alternatives (Alternatives A, B, and C). Unless noted, all numbers shown related to storages, flows, exports, and deliveries in this chapter are generated from the CALSIM-II computer simulation model.

This chapter describes changes in the surface water resources associated with Existing Conditions, the No Project/No Action Alternative, and the three action alternatives, but does not assess impacts or evaluate the significance of surface water changes, except for evaluating changes in the surface water resources metrics (CVP and SWP deliveries) used to evaluate water supply reliability impacts and significance (refer to Section 6.5).

All other impact and significance determinations that rely on the surface water resources data that are presented in this chapter are described and evaluated in other resource chapters (e.g., changes in reservoir storage and river flows). Chapter 5 Guide to the Resources Analyses describes the relationship between this chapter and subsequent analyses included in other chapters. Appendixes 6A and 6B describe the assumptions and the analytical framework used, and presents maps showing the specific locations used for surface water and surface water quality analyses.

6.2 Environmental Setting/Affected Environment

6.2.1 Extended Study Area

The Extended Study Area includes San Luis Reservoir, which is jointly operated by both the CVP and SWP. The Extended Study Area also includes the service areas of the CVP (operated and maintained by the U.S. Bureau of Reclamation [Reclamation]) and the SWP (operated and maintained by the California Department of Water Resources [DWR]).

6.2.1.1 San Luis Reservoir

The San Luis Unit, which is part of the CVP and the SWP, was authorized in 1960. Reclamation and DWR constructed and operate this unit jointly. Some features of the San Luis Unit are "joint-use facilities" of the federal government and the State. The joint-use facilities are O'Neill Dam and Forebay, B.F. Sisk San Luis Dam, San Luis Reservoir, William R. Gianelli Pumping/Generating Plant, Dos

Amigos Pumping Plant, Los Banos and Little Panoche reservoirs, San Luis Canal from O'Neill Forebay to Kettleman City, and the associated switchyard facilities.

Completed in 1967 and dedicated on April 20 of that year, B. F. Sisk Dam (which created San Luis Reservoir) is a zoned earthfill structure 382 feet high with a crest length of 18,600 feet; it contains 77,656,000 cubic yards of material. The dam's crest is 30 feet thick; the maximum base width is 2,420 feet. The reservoir filled for the first time on May 31, 1969. San Luis Reservoir is one of the largest offstream reservoirs in the nation. The reservoir has a capacity of slightly more than 2 million acre-feet (MAF), and is used to store surplus water from the Sacramento-San Joaquin Delta. Reservoir fill and release cycles are similar to other large reservoirs in California, with storage peaking in March (approximately 1.5 MAF average) and at annual minimum levels in August (548,000 acre-feet average). Releases are made through the San Luis Pumping/Generating Plant.

The pumping/generating units lift water from O`Neill Forebay and discharge it into the main reservoir. When not pumping, these units generate electricity by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal, and flows by gravity to Dos Amigos Pumping Plant, where it is lifted more than 100 feet to permit gravity flow to the end of the San Luis Canal at Kettleman City, from which the water continues to flow in the California Aqueduct to southern California. During irrigation months, water from the California Aqueduct flows through O`Neill Forebay into the San Luis Canal instead of being pumped into San Luis Reservoir. Two detention reservoirs, Los Banos and Little Panoche, control cross drainage along the San Luis Canal. The reservoirs also provide recreation and flood control benefits (Reclamation, 2011).

Table 6-1 shows Existing Conditions for average monthly San Luis Reservoir (CVP and SWP) storage over the long term and by water year type for Existing Conditions. Refer to Appendix 6B for San Luis Reservoir surface water elevation and surface area data tables.

Table 6-1
San Luis Reservoir End of Month Storage (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	697	840	1,175	1,338	1,469	1,553	1,324	1,001	682	603	548	617
Water Year Types[b]												
Wet (32%)	912	950	1,290	1,481	1,673	1,848	1,611	1,301	1,028	895	810	879
Above Normal (15%)	643	758	1,123	1,215	1,346	1,496	1,241	883	621	499	448	546
Below Normal (17%)	732	1,025	1,367	1,352	1,448	1,518	1,267	903	537	489	444	568
Dry (22%)	577	801	1,104	1,340	1,431	1,425	1,183	831	416	398	426	489
Critical (15%)	425	523	860	1,132	1,231	1,207	1,064	842	560	518	381	370

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
TAF = thousand acre-feet

6.2.1.2 CVP and SWP Deliveries

The CVP provides water to a range of service contract types delivering Municipal and Industrial (M&I), Agricultural, Settlement, Exchange, and Wildlife Refuge water supplies throughout California's Central

Valley. Settlement and Exchange contractors have the highest degree of reliability due to water rights senior to the CVP. Water service contractors and wildlife refuges are subject to shortages according to water availability and their geographic location. Due to conveyance constraints, water service contractors and wildlife refuges south of the Delta have a lower degree of reliability than water service contractors and wildlife refuges north of the Delta.

California is divided into 10 hydrologic regions (Figure 6-2) that correspond to the State's major water drainage basins (DWR, 2005). Table 6-2 shows the Existing Conditions for CVP deliveries for the hydrologic regions within the Extended Study Area by water service type.

Table 6-2
Central Valley Project Annual Deliveries (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type by Hydrologic Region

	Sacramento River			San Joaquin River			San Francisco Bay		Tulare Lake
Analysis Period	**Ag Service**	**M&I Service**	**Settlement**	**Ag Service**	**M&I Service**	**Exchange**	**Ag Service**	**M&I Service**	**Ag Service**
Long-Term									
Full Simulation Period[a]	223	85	1,908	289	16	852	35	241	600
Water Year Types[b]									
Wet (32%)	316	93	1,900	460	18	875	57	245	956
Above Normal (15%)	310	92	1,913	344	17	875	42	240	712
Below Normal (17%)	221	86	1,949	230	15	875	28	236	482
Dry (22%)	153	80	1,944	197	14	864	24	244	410
Critical (15%)	49	66	1,821	74	11	741	8	234	152

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
TAF = thousand acre-feet
M&I = Municipal and Industrial
Ag = Agricultural

Existing Conditions CVP deliveries reflect the delivery capability of the CVP system, including existing facilities, regulatory requirements, and contractual commitments. Settlement and Exchange deliveries comprise the greatest portion of deliveries for the Sacramento River and San Joaquin River regions, respectively. Agricultural service comprises the majority of the deliveries in San Francisco Bay Region and all of the deliveries in the Tulare Lake Region. Generally, deliveries diminish as conditions get drier. Agricultural service contracts also incur the greatest change in deliveries based upon water year type. For example, Agricultural service deliveries in Critical Years within the Tulare Lake Region (152,000 acre-feet) are 16 percent of the deliveries in Wet years (956,000 acre-feet).

As part of the Central Valley Project Improvement Act (CVPIA), the CVP provides Firm Level 2 Supplies to State Wildlife Refuges, National Wildlife Refuges (NWR), and private wetlands in the Grassland Resource Conservation District (RCD) identified in the CVPIA.

In addition, pursuant to CVPIA, Reclamation is negotiating long-term water supply contracts/agreements for Level 4 Supplies with the California Department of Fish and Game, Grasslands Water District (representing the Grassland RCD), and memoranda of understanding (MOUs) with the U.S. Fish and Wildlife Service (USFWS).

These contracts/agreements and MOUs will provide long-term water supplies (up to 25 years) to specified State wildlife areas, private wetlands in the Grassland RCD, and the NWRs identified in the CVPIA. These Level 4 supplies are in addition to the Firm Level 2 Supplies provided by the CVP.

Table 6-3 shows Existing Conditions for total Wildlife Refuge Water Supply deliveries for the hydrologic regions within the Extended Study Area. These include CVP Contract and Acquisitions supplies.

Table 6-3
Annual Wildlife Refuge Water Supplies[a] (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type by Hydrologic Region

	Sacramento River		San Joaquin River		Tulare Lake	
Analysis Period	**Refuge L2[b]**	**Refuge L4[c] - Acquisition**	**Refuge L2**	**Refuge L4 - Acquisition**	**Refuge L2**	**Refuge L4 - Acquisition**
Long-Term						
Full Simulation[d] Period	129	10	281	62	15	12
Water Year Types[e]						
Wet (32%)	142	11	289	64	16	12
Above Normal (15%)	131	11	289	64	16	12
Below Normal (17%)	137	11	289	64	16	12
Dry (22%)	126	10	285	63	15	12
Critical (15%)	99	9	240	53	13	10

[a]Includes Contract and Acquisitions supplies.
[b]L2 = Level 2 refuge water supply - the firm water supply historically required for existing habitat management.
[c]L4 = Level 4 refuge water supply - the increased amount of water above Level 2 needed to achieve optimum waterfowl habitat management.
[d]Based on CALSIM-II modeling over an 82-year simulation period.
[e]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
TAF = thousand acre-feet

The SWP provides water to a range of service contract types delivering M&I and agricultural water supplies to service areas in northern California, including the Feather River Service Area (FRSA), the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and southern California. FRSA contractors are located north of the Delta and hold pre-SWP priority senior delivery rights.

Table 6-4 shows Existing Conditions for SWP contract deliveries for the hydrologic regions within the Extended Study Area by water service type. Existing Conditions SWP deliveries reflect the delivery capability of the SWP system, including existing facilities, regulatory requirements, and contractual commitments. Total deliveries of the SWP system are dominated by Agricultural Service in the Tulare Lake Region and M&I Service in the South Coast Region. Deliveries are diminished as conditions become drier, based upon water year type. For example, South Coast M&I Service deliveries in Critical years (757,000 acre-feet) are 50 percent of those deliveries in Wet years (1,517,000 acre-feet).

Table 6-4
Annual State Water Project Deliveries (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type Hydrologic Region

	Sacramento River	San Joaquin River	San Francisco Bay	Central Coast	Tulare Lake		South Lahontan	South Coast	
Analysis Period	**M&I Service**	**Ag Service**	**M&I Service**	**M&I Service**	**Ag Service**	**M&I Service**	**M&I Service**	**Ag Service**	**M&I Service**
Long-Term									
Full Simulation Period[a]	24	4	190	45	695	87	261	9	1,305
Water Year Types[b]									
Wet (32%)	31	5	219	55	922	114	299	11	1,517
Above Normal (15%)	25	4	192	46	723	92	253	9	1,399
Below Normal (17%)	23	4	206	47	687	86	283	8	1,391
Dry (22%)	20	3	182	42	584	75	252	7	1,240
Critical (15%)	12	2	121	25	353	44	171	4	757

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
TAF = thousand acre-feet
M&I = Municipal and Industrial
Ag = Agricultural

Table 6-5 shows the average annual SWP contract FRSA deliveries over the long term and by water year type for Existing Conditions.

Table 6-5
Annual State Water Project Feather River Service Area Deliveries (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Annual Delivery
Full Simulation Period[a]	948
Water Year Types[b]	
Wet (32%)	973
Above Normal (15%)	983
Below Normal (17%)	980
Dry (22%)	986
Critical (15%)	769

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
TAF = thousand acre-feet

6.2.2 Secondary Study Area

The Secondary Study Area is defined as the CVP and SWP reservoirs, rivers, creeks, and associated floodplains that could be affected by Project operations, located in 22 counties.

The Secondary Study Area includes the following reservoirs, rivers, creeks, and floodplains: Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay. They are discussed below.

6.2.2.1 Trinity Lake

The Trinity River Division consists of Trinity Dam and Lake, Trinity Power Plant, Lewiston Dam and Lake, Lewiston Power Plant, Clear Creek Tunnel, Judge Francis Carr Powerhouse, Whiskeytown Dam and Lake, Spring Creek Tunnel and Power Plant, Spring Creek Debris Dam and Reservoir, as well as related pumping and distribution facilities.

The Trinity Dam and facilities transfer water from the Trinity River basin to the Sacramento River Basin. Water from the Trinity River Basin is stored, regulated, and diverted through a system of dams, reservoirs, tunnels, and power plants. The system diverts the water south into Clear Creek, the Sacramento River, and the Central Valley.

Trinity Dam regulates flows and stores water for various uses. Completed in 1962, Trinity Dam is an earthfill structure 538 feet high with a crest length of 2,450 feet. The dam forms Trinity Lake. Trinity Lake, located approximately 50 miles west of the City of Redding, has a capacity of approximately 2.4 MAF and is operated for a variety of purposes: irrigation water supply, flood control, improved Sacramento River navigation, domestic and industrial water supply, electric power generation, fish and wildlife conservation, creation of recreation opportunities, and water quality enhancement. Releases from Trinity Dam through the downstream Trinity Power Plant are regulated downstream at Lewiston Reservoir for downstream flow requirements and diversions through the Clear Creek Tunnel to Keswick Reservoir. The outflow from Trinity and Lewiston reservoirs also provides water to meet temperature objectives for special-status species in the Trinity and upper Sacramento rivers.

The minimum instream flow requirements downstream of Lewiston Dam on the Trinity River that were stipulated in the Trinity River Record of Decision (ROD) (Reclamation, 2000) affect storage within Trinity Lake.

Storage varies between approximately 1.3 MAF (October) and 1.8 MAF (April), based upon the long-term average end-of-month storage. The variation from average is most significant in Critical year types, where end-of-month storage is reduced by up to 55 percent in November; Critical Year November storage is approximately 590,000 acre-feet, and long-term average November storage is approximately 1.3 MAF (Reclamation, 2011).

Table 6-6 shows Existing Conditions for average monthly Trinity Lake storage over the long term and by water year type. Refer to Appendix 6B for Trinity Lake surface water elevation and area data tables.

Table 6-6
Trinity Lake End-of-Month Storage (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	1,306	1,314	1,366	1,427	1,537	1,659	1,807	1,803	1,767	1,631	1,494	1,373
Water Year Types[b]												
Wet (32%)	1,738	1,746	1,764	1,753	1,913	2,047	2,224	2,260	2,239	2,111	1,997	1,845
Above Normal (15%)	1,547	1,542	1,571	1,523	1,676	1,845	2,015	2,020	1,992	1,869	1,736	1,601
Below Normal (17%)	1,211	1,245	1,328	1,316	1,390	1,487	1,658	1,643	1,598	1,466	1,335	1,232
Dry (22%)	1,070	1,074	1,182	1,322	1,405	1,533	1,664	1,615	1,552	1,404	1,235	1,127
Critical (15%)	595	589	621	913	952	1,023	1,083	1,062	1,040	886	734	653

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
TAF = thousand acre-feet

6.2.2.2 Lewiston Lake

Lewiston Dam was constructed by Reclamation from 1960 to 1963. Lewiston Lake is formed by Lewiston Dam on the Trinity River. It has a capacity of approximately 14,600 acre-feet. Lewiston Power Plant is located at the base of Lewiston Dam. It diverts water through the Clear Creek Tunnel to Whiskeytown Lake. The power plant began operating in 1964.

Although developed primarily for irrigation, this multiple-purpose project also provides flood control, improves Sacramento River navigation, supplies domestic and industrial water, generates electric power, conserves fish and wildlife, creates opportunities for recreation, and enhances water quality.

Lewiston maintains and regulates river releases and provides power to the adjacent Trinity River Fish Hatchery. Energy in excess of hatchery loads is sold to Pacific Gas and Electric Company (Reclamation, 2011).

6.2.2.3 Trinity River

The Trinity River, located in northwest California, is the largest tributary to the Klamath River. Water export and energy generation from the Trinity River were envisioned as early as 1931 when plans for diverting Trinity River water to the Sacramento River were included as part of the California State Water Plan.

The 2000 Trinity River ROD stipulated specific releases to the Trinity River downstream of Lewiston Dam to meet instream flow requirements. The total volume of water released to the Trinity River ranges from approximately 369,000 acre-feet to 815,000 acre-feet, depending on the annual water-year type (hydrology) determined as of April 1st (Reclamation, 2000). Table 6-7 shows the annual flow volumes, peak flows, and peak flow durations by water type[1].

[1] The water year types included in the Trinity ROD are probability-based and classified by ranges of annual Trinity River Basin water year runoff. This classification is different from the water year types presented in all other tables of this chapter, which are based on the historical record of WY1922 through WY2003 and defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 2000).

Table 6-7
Trinity River Record Of Decision
Annual Flow Volumes and Peak Flows

Water Year Type	Volume (AF)	Peak Flow (cfs)	Peak Flow Duration (days)
Extremely Wet	815,000	11,000	5
Wet	701,000	8,500	5
Normal	647,000	6,000	5
Dry	453,000	4,500	5
Critically Dry	369,000	1,500	36

Notes:
cfs = cubic feet per second
AF = acre-feet

Source: Reclamation, 2000.

The release schedules based on water year type have a minimum release of 450 cubic feet per second (cfs) between October 1st through October 15th, and 300 cfs from October 16th through April 21st. Release schedules are variable, based upon water year type between April 22nd and July 21st. Releases across all water year types are then fixed at a minimum of 450 cfs from July 22nd through September 30th (Reclamation, 2000).

Table 6-8 shows Existing Conditions for average monthly Trinity River flow downstream of Lewiston Lake over the long term and by water year type. Trinity River long-term average flows by month vary between 365 cfs in November and 3,779 cfs in May.

Table 6-8
Trinity River Monthly Flow Downstream of Lewiston Reservoir (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	368	365	523	662	644	617	583	3,779	2,108	923	450	450
Water Year Types[b]												
Wet (32%)	373	300	856	1,436	1,056	1,227	716	4,636	3,371	1,289	450	450
Above Normal (15%)	373	741	621	316	760	436	469	4,462	2,488	1,048	450	450
Below Normal (17%)	373	300	300	300	517	319	507	3,774	1,672	869	450	450
Dry (22%)	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Critical (15%)	342	300	300	300	300	300	575	2,092	783	450	450	450

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
cfs = cubic feet per second

The Trinity River ROD release schedules are clearly reflected in the monthly flows by water year type. For example, the 300 cfs minimum flow requirement is reflected in the Below Normal, Dry, and Critical water years during November through March. The 450 cfs minimum flow requirement during August and September is clearly reflected across all water years.

6.2.2.4 Klamath River Downstream of the Trinity River

The Klamath River begins in the southeastern part of Oregon and flows approximately 263 miles southwest through northern California, flowing through the southern Cascade Range to empty into the Pacific Ocean. The Trinity River is the largest tributary of the Klamath River. The Trinity River joins the Klamath River at Weitchpec approximately 44 miles upstream of the Pacific Ocean.

The Trinity River confluence also marks the point where Klamath River flows slow down dramatically. For the remainder of its course, it flows generally northwest through the Hoopa Valley and Yurok Indian reservations, passing the town of Klamath and flowing out to sea 16 miles south of Crescent City. The mouth of the Klamath River is located at the community of Requa.

6.2.2.5 Clear Creek

Since 1964, a portion of the flow from the Trinity River Basin has been exported to the Sacramento River Basin through CVP facilities. Water is diverted from the Trinity River at Lewiston Dam via the 11-mile-long Clear Creek Tunnel and passes through the Judge Francis Carr Powerhouse as it is discharged into Whiskeytown Lake on Clear Creek.

Table 6-9 shows Existing Conditions for average monthly Clear Creek Tunnel flow over the long term and by water year type. The long-term average monthly flow in the Clear Creek Tunnel ranges from 92 cfs (February) to 1,866 cfs (August). The relative timing of flow in the Clear Creek Tunnel is unnatural because higher flows occur in summer and lower flows occur in winter.

Table 6-9
Clear Creek Tunnel Monthly Flow (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	981	382	243	468	92	268	403	155	518	1,782	1,866	1,660
Water Year Types[b]												
Wet (32%)	1,556	494	497	428	81	313	403	259	344	1,760	1,566	2,192
Above Normal (15%)	904	416	283	269	58	317	585	0	163	1,417	1,771	1,917
Below Normal (17%)	464	157	79	286	80	387	342	50	615	1,573	1,743	1,342
Dry (22%)	769	438	94	561	115	152	339	209	956	1,933	2,329	1,417
Critical (15%)	734	283	67	826	131	152	389	125	479	2,212	2,058	987

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-10 shows Existing Conditions for average monthly Clear Creek flow downstream of Whiskeytown Lake over the long term and by water year type. The long-term average monthly flow in Clear Creek downstream of Whiskeytown Lake ranges from 85 cfs (July) to 194 cfs (February).

Table 6-10
Clear Creek Monthly Flow Downstream of Whiskeytown Reservoir (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	182	183	184	193	194	188	188	262	180	85	86	146
Water Year Types[b]												
Wet (32%)	200	200	200	221	220	200	200	277	200	85	85	150
Above Normal (15%)	200	200	200	192	196	196	196	277	200	85	85	150
Below Normal (17%)	193	193	193	189	189	189	189	263	181	85	85	150
Dry (22%)	181	182	182	184	184	184	187	264	180	85	85	144
Critical (15%)	117	118	125	155	155	155	155	211	115	85	94	133

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.6 Whiskeytown Lake

Whiskeytown Dam was constructed in 1963 by Reclamation. Located approximately eight miles west of Redding, it was one of the first units of the Trinity River Diversion of the CVP to be constructed. The earthfill dam, located on Clear Creek, is 282 feet high and 4,000 feet long. Crest elevation is 1,228 feet. Whiskeytown Dam regulates Trinity River flows discharged from the Judge Francis Carr Powerhouse and regulates the runoff from the Clear Creek drainage area. Whiskeytown Lake has a capacity of approximately 241,000 acre-feet.

Whiskeytown Lake is normally operated to regulate inflows for power generation and recreation, support upper Sacramento River temperature objectives, and provide releases to Clear Creek, consistent with CVPIA Anadromous Fish Restoration Program (AFRP) objectives.

Historically (1964 to 1992), approximately 1.3 MAF of water has been diverted annually from Whiskeytown Lake to Keswick Reservoir. This represents approximately 17 percent of the flow measured in the Sacramento River at Keswick.

Operations at Whiskeytown Lake during flood conditions are complicated by its operational relationship with the Trinity River, Sacramento River, and Clear Creek. On occasion, imports of Trinity River water to Whiskeytown Lake may be suspended to avoid increasing flows under high flow conditions in the Sacramento basin. Heavy rainfall events occasionally result in spillway discharges to Clear Creek.

Water rights permits issued by SWRCB for diversion from Trinity River and Clear Creek specify minimum downstream releases from Lewiston and Whiskeytown dams, respectively (Reclamation, 2011).

6.2.2.7 Spring Creek

The Spring Creek Tunnel diverts water from Whiskeytown Lake on Clear Creek to the Spring Creek Power Plant. The tunnel is 18.5 feet in diameter and approximately 2.4 miles long, including the 0.6-mile-long 17-foot-diameter Rock Creek Siphon. The Spring Creek Power Plant (a peaking plant that has been operating since 1964) is located at the foot of the Spring Creek Debris Dam. Water from the plant is discharged to Keswick Reservoir.

Spring Creek also flows into the Sacramento River and enters at Keswick Reservoir. Flows on Spring Creek are partially regulated by the Spring Creek Debris Dam.

The Spring Creek Debris Dam, located on Spring Creek upstream of the Spring Creek Power Plant tailrace, is an earthfill structure that is 196 feet high with a crest length of 1,110 feet. Spring Creek Reservoir has a capacity of approximately 5,800 acre-feet. It controls debris that would otherwise enter the power plant tailrace, and provides important fishery and water quality benefits by controlling contaminated runoff resulting from old mine tailings on Spring Creek (Reclamation, 2011).

6.2.2.8 Shasta Lake

Shasta Dam was constructed in 1945 by Reclamation as an integral element of the CVP for six purposes: irrigation water supply, M&I water supply, flood control, hydropower generation, fish and wildlife conservation, and navigation. Shasta Dam is located on the upper Sacramento River approximately nine miles northwest of Redding. Shasta Lake has a storage capacity of approximately 4.5 MAF. Shasta Lake captures runoff from approximately 6,665 square miles. Shasta Power Plant, a peaking power plant, is located downstream of Shasta Dam on the Sacramento River. Pertinent data for Shasta Dam and Lake are shown in Table 6-11.

Table 6-11
Shasta Dam and Lake Pertinent Data

	Elevation (feet)	Area (acres)	Capacity (TAF)
Inactive Pool	840	6,700	587
Bottom Flood Control Pool[a]	1,019	24,000	3,252
Gross (Full) Pool[b]	1,067	29,500	4,552

[a]Maximum Controlled Release: 81,800 cfs
[b]Spillway Capacity: 186,000 cfs

Note:
TAF = thousand acre-feet

Source: Reclamation, 2011.

Shasta Lake has an average annual inflow of 5.9 MAF. The flood control storage space is 1.3 MAF. Inflows to the lake generally increase during November through March, with maximum storage occurring in April or May following the months of highest inflow. After the spring snowmelt has ended, typical June through October flow into the reservoir is less than 5,000 cfs. Seasonal storage and releases average approximately 1.5 MAF with year-to-year carryover averaging about 2.8 MAF.

The entire outflow from Shasta Lake flows into, and is regulated through, Keswick Reservoir, which is located approximately nine miles downstream of Shasta Dam. Releases from Shasta Reservoir are managed to meet minimum fish flows and temperature requirements, flood control requirements, salinity control, and water supply demands of CVP contractors (Reclamation, 2011).

Shasta Lake is the largest reservoir in California, and as such, is the foundation storage facility of the CVP system. The operation of Shasta Lake has greatly changed the natural flow conditions of the Sacramento River downstream of Keswick Reservoir. Flood peaks are reduced in the winter and spring, and discharges are increased during the summer and fall for irrigation, fish, and other uses.

A temperature control device (TCD) was installed at Shasta Dam between 1996 and 1998 to both minimize power losses and control the water temperature downstream of Shasta Lake to protect salmon.

The new TCD has allowed for warmer water withdrawals in the spring/early summer, resulting in conservation of the deep cold water pool for colder withdrawals in the late summer/early fall to meet downstream temperature requirements.

Table 6-12 shows Existing Conditions for average monthly Shasta Lake storage over the long term and by water year type. Over the long-term average, Shasta Lake end-of-month storage varies between 2,549,000 acre-feet in November and 3,939,000 acre-feet in May.

Table 6-12
Shasta Lake End-of-Month Storage (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	2,571	2,549	2,703	2,979	3,260	3,615	3,910	3,939	3,635	3,159	2,825	2,651
Water Year Types[b]												
Wet (32%)	3,073	2,958	3,097	3,414	3,638	3,863	4,318	4,471	4,290	3,882	3,528	3,170
Above Normal (15%)	2,996	2,914	3,081	3,145	3,425	3,962	4,402	4,478	4,128	3,563	3,229	3,085
Below Normal (17%)	2,859	2,929	2,998	2,928	3,305	3,693	4,061	4,090	3,756	3,263	2,938	2,882
Dry (22%)	2,331	2,390	2,632	2,823	3,187	3,667	3,816	3,729	3,353	2,844	2,504	2,423
Critical (15%)	1,084	1,091	1,233	2,160	2,331	2,560	2,498	2,390	2,007	1,539	1,246	1,165

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
TAF = thousand acre-feet

Water in storage in Shasta Lake is reduced, especially in Critical water years, up to 58 percent in October (from 2,571,000 acre-feet long-term average to 1,084,000 acre-feet during Critical water years). Refer to Appendix 6B for Shasta Lake surface water elevation and area data tables.

6.2.2.9 Keswick Reservoir

Since 1964, flow from the Trinity River has been imported to Whiskeytown Lake and then to Keswick Reservoir. Keswick Dam and Reservoir is located approximately nine miles downstream from Shasta Dam and five miles west of the City of Redding. Keswick Power Plant is located at Keswick Dam. Keswick Reservoir has a storage capacity of approximately 24,000 acre-feet.

Keswick Reservoir receives inflows from Whiskeytown Lake on Clear Creek and regulates all outflows from Shasta Lake that flow into and through the reservoir. Keswick Dam controls runoff from 45 square miles of drainage area. Nearly all releases from Keswick Dam are made through its generating facilities. On occasion, however, outflows during flood operations are made through the flood control outlets and over the spillway. During these instances, the existing power plant is bypassed for much of the flood release.

Releases from Keswick Reservoir are managed to meet minimum fish flow and temperature requirements, flood control requirements, salinity control requirements, and water supply demands of CVP contractors (Reclamation, 2011).

6.2.2.10 Sacramento River

The Sacramento River is the largest river in California. Runoff from the upper Sacramento River and its tributaries are regulated by Shasta Dam and Lake, and then by Keswick Dam and Reservoir.

Downstream of Keswick Reservoir, the Sacramento River is also influenced by tributary stream runoff from precipitation and snowmelt; diversions for agricultural, municipal, and industrial purposes; agricultural and municipal discharges; and a flood damage reduction system that includes levees, floodplains (including the Yolo, Sutter, and Colusa bypasses), and weirs.

The Sacramento River flood channel capacity between Red Bluff and Chico Landing near the mouth of Stony Creek is approximately 260,000 cfs. The Sacramento River Flood Control Project levees begin near Ord Bend. From Ord Bend to below Butte City, the Sacramento River flood channel capacity is approximately 160,000 cfs. Floodwaters exceeding the channel capacity between Chico Landing and Colusa Weir overflow into the Butte Sink area and then to the Sutter Bypass. The capacity of the Sacramento River decreases to approximately 110,000 cfs downstream of Moulton Weir, and to approximately 48,000 cfs downstream of Colusa Weir (USACE, 1960).

Annual diversions from the Sacramento River upstream of the Feather River average approximately 1.7 MAF. Major diversions occur at the Red Bluff Diversion Dam (RBDD) into the Tehama-Colusa (T-C) and Corning canals, and at the Glenn-Colusa Irrigation District (GCID) Canal at Hamilton City. Surface water demands along the Sacramento River between Red Bluff and Colusa are more than 2.3 MAF annually, including water supplies for Sacramento Valley refuges, agricultural activities, and urban uses.

The Sacramento River channel downstream of Colusa is quite different than upstream of Colusa. Downstream of Colusa, the gradient of the river decreases, the channel becomes deeper and narrower, the capacity decreases, and the bed material is finer (SRAC, 1998). The river is also contained by levees with excess flow bypassed through spills at Tisdale, Fremont, and Sacramento weirs. The bypassed flow goes into the Sutter Bypass and the Yolo Bypass. The Feather River joins the Sacramento River at the community of Verona, and the American River joins at the City of Sacramento. The Sacramento River then flows south, joining with the San Joaquin River in the Delta, and out to the Pacific Ocean.

Numerous small and large streams flow into the Sacramento River. The major tributaries feeding into the Sacramento River are listed in Table 6-13.

Table 6-13
Major Tributaries of the Sacramento River Downstream of Shasta Dam

West Side	East Side
Clear Creek	Cow Creek and Bear Creek
Cottonwood Creek	Battle Creek
Elder Creek	Paynes Creek
Thomes Creek	Antelope Creek
Stony Creek	Mill Creek
Colusa Basin Drain	Deer Creek
Cache Creek	Big Chico Creek
Putah Creek	Butte Creek
	Feather River
	American River

Table 6-14 shows Existing Conditions for average monthly Sacramento River flow downstream of Keswick Reservoir over the long term and by water year type. Long-term average Sacramento River monthly streamflow downstream of Keswick Reservoir varies between 6,248 cfs in October and 10,154 cfs in February. Streamflow downstream of Keswick Reservoir varies by year type, similar to Shasta Lake storage. Critical water year streamflow is decreased by up to 65 percent in February (3,591 cfs), compared to long-term average flow (10,154 cfs). Wet water year streamflow is increased by up to 92 percent in January (15,878 cfs), compared to long-term average flow (8,252 cfs).

Table 6-14
Sacramento River Monthly Flow Downstream of Keswick Reservoir (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	6,248	6,621	6,866	8,252	10,154	8,553	6,998	7,881	10,711	13,036	10,467	7,909
Water Year Types[b]												
Wet (32%)	7,485	8,758	7,585	15,878	18,374	16,094	9,415	9,514	10,374	12,762	11,001	12,009
Above Normal (15%)	5,980	8,513	6,903	7,591	14,202	8,625	6,182	7,700	11,172	14,150	10,441	7,812
Below Normal (17%)	5,440	5,162	8,203	4,284	5,370	4,841	5,321	6,918	10,678	12,780	9,954	5,371
Dry (22%)	5,844	5,081	7,101	3,967	3,678	3,820	5,713	7,235	11,136	13,238	10,620	5,752
Critical (15%)	5,385	4,108	3,357	3,447	3,591	3,571	6,464	6,617	10,383	12,509	9,705	5,320

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-15 shows Existing Conditions for average monthly Sacramento River flow downstream of the RBDD over the long term and by water year type. The long-term average monthly flow in the Sacramento River downstream of RBDD ranges from 7,032 cfs (October) to 17,941 cfs (February). Flow at this location is slightly less than the upstream flow at Bend Bridge in a few months due to diversions.

Table 6-15
Sacramento River Monthly Flow Downstream of Red Bluff Diversion Dam (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	7,032	8,787	11,637	15,206	17,941	14,579	10,565	9,466	10,911	12,412	9,946	8,154
Water Year Types[b]												
Wet (32%)	8,281	11,194	12,240	27,681	30,270	25,051	15,105	11,949	10,894	12,072	10,333	12,262
Above Normal (15%)	6,884	10,747	11,818	16,243	23,485	16,211	10,353	9,416	11,011	13,079	9,679	8,013
Below Normal (17%)	6,452	7,417	13,282	9,283	11,483	8,999	8,451	8,103	10,722	12,058	9,413	5,588
Dry (22%)	6,538	7,247	12,902	7,144	9,009	8,355	7,747	8,285	11,203	12,768	10,303	6,047
Critical (15%)	5,895	5,520	6,332	6,144	6,618	6,102	7,634	7,501	10,632	12,364	9,462	5,551

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
cfs = cubic feet per second

Table 6-16 shows Existing Conditions for average monthly Sacramento River flow downstream of Hamilton City over the long term and by water year type. The long-term average monthly flow in the Sacramento River downstream of Hamilton City ranges from 6,619 cfs (October) to 20,300 cfs (February). Again, tributary inflow increases flow in most months and diversion reduces flow in a few months, when compared to the upstream location.

Table 6-16
Sacramento River Monthly Flow Downstream of Hamilton City (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	6,619	9,075	12,936	17,250	20,300	16,660	10,162	8,718	8,620	9,888	8,073	7,785
Water Year Types[b]												
Wet (32%)	7,853	11,556	13,484	31,340	33,977	28,110	15,739	11,993	8,997	9,663	8,472	11,920
Above Normal (15%)	6,474	11,083	13,152	18,882	26,624	18,886	10,245	8,864	8,710	10,487	7,736	7,644
Below Normal (17%)	6,147	7,766	14,677	10,647	13,229	10,421	7,874	7,027	8,254	9,373	7,410	5,181
Dry (22%)	6,042	7,550	14,569	7,957	10,413	9,935	6,626	6,905	8,520	10,084	8,346	5,656
Critical (15%)	5,503	5,510	7,053	6,733	7,425	6,994	5,970	6,169	8,287	10,085	7,909	5,200

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-17 shows Existing Conditions for monthly Sacramento River flow downstream of the proposed Delevan Pipeline Intake for averages over the long term and by water year type. The long-term average monthly flow in the Sacramento River downstream of the proposed Delevan Pipeline Intake ranges from 6,306 cfs (October) to 25,420 cfs (February).

Table 6-17
Sacramento River Monthly Flow Downstream of the Proposed Delevan Pipeline Intake (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	6,306	9,052	14,656	21,192	25,420	19,912	11,635	8,443	7,819	8,727	7,319	7,972
Water Year Types[b]												
Wet (32%)	7,634	11,475	15,519	38,450	42,982	32,866	19,105	12,303	8,817	8,651	7,724	12,246
Above Normal (15%)	6,246	11,166	14,847	24,460	32,370	24,091	11,987	8,976	7,824	9,124	7,024	7,851
Below Normal (17%)	5,946	8,101	16,785	12,874	16,828	12,226	8,830	6,775	7,233	8,097	6,559	5,317
Dry (22%)	5,556	7,438	16,198	9,455	13,318	12,085	6,699	5,929	7,278	8,920	7,469	5,731
Critical (15%)	5,031	5,218	7,798	7,843	8,597	8,377	5,773	5,267	7,149	8,942	7,403	5,291

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.11 Glenn-Colusa Irrigation District Canal

The GCID's Main Pump Station, located approximately five miles northwest of Hamilton City, diverts water into the existing GCID Canal for distribution to over 130,000 acres of irrigated lands within the GCID service area. The approximately 65-mile-long Canal terminates at the Colusa Basin Drain (CBD) near the town of Williams, California.

GCID's system has undergone significant infrastructure and operational changes; infrastructure changes have included a major expansion of the GCID Fish Screen (completed in 2001) and several improvements along the Canal to allow year-round water delivery operations. Two major operational changes included a shift to year-round water delivery to provide water in the fall and winter to the federal Sacramento National Wildlife Refuge complex, as well as to meet increased fall and winter season water demands for rice straw decomposition purposes.

The existing Canal is an unlined earthen channel with capacity varying from 3,000 cfs at the upstream end to 300 cfs at its terminus. Approximately 40 miles of the Canal, from the Main Pump Station south to the proposed Terminal Regulating Reservoir (TRR), would be used for conveying water to the proposed Sites Reservoir. The 40-mile section of the Canal has six main reaches. There are 40 major structures within this area, including bridges, siphons, and check structures.

Table 6-18 shows Existing Conditions for average monthly GCID Canal Intake flow over the long term and by water year type. Long-term average monthly GCID Canal flow ranges from 52 cfs (February) to 2,818 cfs (June).

Table 6-18
Glenn-Colusa Irrigation District Canal Intake Monthly Flow at Hamilton City (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	675	391	180	71	52	117	2,096	2,054	2818	2,668	1,916	528
Water Year Types[b]												
Wet (32%)	706	404	197	67	52	105	1,931	2,085	2,864	2,728	1,977	561
Above Normal (15%)	703	398	175	61	49	100	2,063	2,047	2,900	2,738	1,988	548
Below Normal (17%)	692	406	170	77	52	125	2,200	2,139	2,862	2,746	2,011	547
Dry (22%)	696	376	191	74	54	122	2,213	2,111	2,889	2715	1,944	526
Critical (15%)	533	362	145	77	53	145	2,188	1,810	2,479	2,306	1,560	418

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
cfs = cubic feet per second

6.2.2.12 Tehama-Colusa Canal

Constructed in 1980 by Reclamation, the T-C Canal is a lined canal that is approximately 111 miles long. It extends from the RBDD in Tehama County to south of the community of Dunnigan in Yolo County. It is operated by the Tehama-Colusa Canal Authority (TCCA) through a Joint Powers Authority comprised of 17 water districts. TCCA delivers water to the 17 water districts' irrigation service areas in Tehama, Glenn, Colusa, and northern Yolo counties. Since the canal operation began, fall and winter diversions have increased due to increased water demands for rice straw decomposition purposes.

Water from the Sacramento River enters the T-C Canal Intake at the RBDD. Canal capacity is 2,530 cfs at the start and 1,700 cfs at the terminus. Canal flows enter Funks Reservoir approximately 66 canal miles downstream from the RBDD. The canal capacity at Funks Reservoir is 2,100 cfs.

Table 6-19 shows Existing Conditions for average monthly T-C Canal Intake flow over the long term and by water year type. Long-term average monthly T-C Canal Intake flow ranges from 0 cfs (December and January) to 830 cfs (July).

Table 6-19
Tehama Colusa Canal Intake Monthly Flow at Red Bluff Diversion Dam (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	109	11	0	0	3	20	155	435	725	830	666	175
Water Year Types[b]												
Wet (32%)	142	13	0	0	0	16	152	605	1,008	1,159	906	239
Above Normal (15%)	110	8	0	0	0	13	188	594	1,011	1,139	882	233
Below Normal (17%)	105	9	0	0	3	33	186	411	667	772	601	131
Dry (22%)	98	9	0	0	6	20	138	290	491	544	435	126
Critical (15%)	61	13	0	0	9	23	115	154	245	305	354	100

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.13 Lake Oroville and the Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay)

The Oroville Facilities include Oroville Dam and Lake Oroville, three power plants (Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Power Plant, and Thermalito Pumping-Generating Plant), Thermalito Diversion Dam, the Feather River Fish Hatchery and Fish Barrier Dam, Thermalito Power Canal, Oroville Wildlife Area, Thermalito Forebay and Forebay Dam, Thermalito Afterbay and Afterbay Dam, transmission lines, as well as several recreational facilities. The Oroville Facilities were developed as part of the SWP and are operated by DWR.

The mainstem of the Feather River is regulated by Oroville Dam. The dam and its two saddle dams were completed in 1968 and formed Lake Oroville, a 3.5-MAF capacity storage reservoir with a surface area of approximately 16,000 acres at its normal maximum operating level.

The Oroville hydroelectric facilities have a combined licensed generating capacity of approximately 762 megawatts (MW). The facilities consist of the Hyatt Pumping-Generating Plant, the Thermalito Diversion Dam Power Plant, and the Thermalito Pumping-Generating Plant.

The Thermalito Afterbay is used to release water into the Feather River downstream of the hydroelectric facilities. It helps regulate the power system, provides storage for pump-back power operations, and provides recreational opportunities. Several local irrigation districts receive water from the Afterbay during the May through August season.

Operation of the Oroville facilities varies depending upon hydrology and the objectives DWR is trying to meet. Lake Oroville stores winter and spring runoff for release to the Feather River, as necessary, for project purposes. Typically, releases to the Feather River are managed to conserve water while meeting a variety of water delivery requirements, including flow, temperature, fisheries, recreation, diversions, and water quality. Power production is scheduled within the boundaries specified by the water operations criteria.

During the wintertime, the Oroville Facilities are operated pursuant to flood control requirements specified by the U.S. Army Corps of Engineers (USACE). Pursuant to these requirements, Lake Oroville is operated to maintain up to 750,000 acre-feet of storage space to allow for the capture of significant inflows.

Annual operations are conducted for multi-year carryover. The current methodology is to retain half of the Lake Oroville storage above a specific level for subsequent years. Currently, that level has been established at 1 MAF; however, this does not limit drawdown of the reservoir below that level. If hydrology is drier than expected, or requirements greater than expected, additional water would be released from Lake Oroville. The operations plan is updated regularly to reflect changes in hydrology and downstream operations. Project operations are directly constrained by downstream operational constraints and flood management criteria.

An August 1983 agreement between DWR and DFG titled, "*Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish & Wildlife*," sets criteria and objectives for flow and temperatures in the low-flow channel and the reach of the Feather River between Thermalito Afterbay and Verona where the Feather River joins the Sacramento River. This agreement: (1) establishes minimum flows between Thermalito Afterbay Outlet and Verona, which vary by water year type; (2) requires flow changes under 2,500 cfs to be reduced by no more than 200 cfs during any 24-hour period, except for situations such as flood management or failures; (3) requires flow stability during the peak of the fall-run Chinook spawning season; and (4) sets an objective of suitable temperature conditions during the fall months for salmon and during the later spring/summer for shad and striped bass. In addition, the 2006 Feather River Settlement Agreement established minimum flows of 800 cfs during October through March and 700 cfs during April through August across all water year types in the low-flow channel.

Table 6-20 shows Existing Conditions for average end-of-month Lake Oroville storage over the long term and by water year type. The long-term average end-of-month Lake Oroville storage ranges from 1,812,000 acre-feet (October) to 3,015,000 acre-feet (May). In Critical water years, storage in Lake Oroville is reduced by more than 50 percent in July (1,153,000 acre-feet), as compared to long-term average (2,426,000 acre-feet). Refer to Appendix 6B for Lake Oroville surface water elevation and area data tables.

Table 6-20
Lake Oroville End-of-Month Storage (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	1,812	1,868	2,006	2,203	2,405	2,606	2,879	3,015	2,908	2,426	2,135	1,883
Water Year Types[b]												
Wet (32%)	2,464	2,503	2,544	2,697	2,868	2,945	3,303	3,507	3,488	3,146	2,987	2,563
Above Normal (15%)	2,012	2,071	2,178	2,321	2,624	2,938	3,300	3,498	3,398	2,842	2,478	2,090
Below Normal (17%)	1,906	1,972	2,184	2,108	2,352	2,608	2,984	3,206	3,109	2,526	2,129	1,965
Dry (22%)	1,236	1,328	1,590	1,904	2,122	2,415	2,608	2,654	2,452	1,879	1,426	1,303
Critical (15%)	954	975	1,081	1,571	1,669	1,824	1,820	1,788	1,608	1,153	1,015	975

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
TAF = thousand acre-feet

6.2.2.14 Feather River

Lower Feather River flows vary as water released at the Oroville Dam facilities travels down to the confluence with the Sacramento River at Verona. At the upper extent, the approximate eight-mile low flow section contains mainly riffles and runs. The low-flow section also has a series of remnant gravel pit pools/ponds that connect to the main channel. This stretch is fairly confined by levees as it flows through the City of Oroville. The 2006 Feather River Settlement Agreement established minimum flows of 800 cfs during October through March and 700 cfs during April through August across all water year types in the low-flow channel. From the downstream end of the low-flow section, the Feather River is fairly active and meanders its way south to Marysville. However, this stretch is bordered by active farmland, which confines the river into an incised channel in certain stretches.

Table 6-21 shows Existing Conditions for monthly Feather River flow downstream of the Thermalito Complex for averages over the long term and by water year type. The long-term average monthly flow in the Feather River downstream of the Thermalito Complex ranges from 2,282 cfs (November) to 6,079 cfs (March).

Table 6-21
Feather River Monthly Flow Downstream of the Thermalito Complex (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	2,935	2,282	3,523	4,739	5,651	6,079	3,076	3,645	3,625	7,632	4,837	4,626
Water Year Types[b]												
Wet (32%)	3,888	3,486	5,622	10,678	11,699	12,513	6,499	7,531	5,063	6,479	3,292	7,931
Above Normal (15%)	3,714	2,323	3,340	3,586	5,659	7,115	2,252	3,366	3,291	8,874	6,037	6,935
Below Normal (17%)	2,770	1,998	2,618	1,756	3,045	2,383	1,119	1,137	2,655	8,938	6,243	2,571
Dry (22%)	2,225	1,478	2,510	1,604	1,757	2,009	1,330	1,555	3,157	8,221	6,778	2,038
Critical (15%)	1,346	1,172	1,731	1,209	1,421	1,516	1,388	1,566	2,679	6,481	2,432	1,436

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Downstream from Wilkins Slough, the Feather River enters the Sacramento River upstream of Verona. Between Wilkins Slough and Verona, floodwater is diverted at two places: Tisdale Weir into the Tisdale Bypass, and Fremont Weir into the Yolo Bypass. The bypass system routes floodwater away from the Sacramento River mainstem to discharge into the Delta.

6.2.2.15 Sutter Bypass

The Sutter Bypass is a narrow floodwater bypass that conveys Sacramento River flood flows. The bypass is an expansive land area for agriculture in Sutter County. In times of high water, Sacramento River water enters the bypass through the Butte Slough outfall and the Tisdale Weir (when the stage exceeds 45.45 feet) and inundates the bypass with as much as 12 feet of water.

The Sutter Bypass receives water from natural runoff areas south of Chico, overflow and weir flow from the Sacramento River, and drainage from the east side of the bypass through Wadsworth Canal and pumping plants. The bypass meets the Feather River upstream of the confluence with the Sacramento River near the Fremont Weir. The Fremont Weir is a floodway; when the water level in the Sacramento

River reaches a high level, water flows over the Fremont Weir into the Yolo Bypass. The Feather River and Sutter Bypass flow in a joint channel to the Sacramento River.

Table 6-22 shows Existing Conditions for average monthly Tisdale Weir flow into the Sutter Bypass over the long term and by water year type. Over the long-term average, Tisdale Weir flow into the Sutter Bypass ranges from 0 cfs (July to September) to 3,232 cfs (February). Flows occur even in some Critical water years during December through March. Refer to Appendix 6C for detailed tables of weir flows into the Sutter Bypass.

Table 6-22
Tisdale Weir Monthly Flow into Sutter Bypass (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	9	151	1,017	2,245	3,232	2,127	899	89	47	0	0	0
Water Year Types[b]												
Wet (32%)	0	96	1,088	5,283	7,222	4,819	2,391	170	147	0	0	0
Above Normal (15%)	0	513	1,109	2,723	3,702	3,230	791	241	0	0	0	0
Below Normal (17%)	53	101	1,292	611	1,206	270	145	0	0	0	0	0
Dry (22%)	0	128	1,263	263	818	365	0	0	0	0	0	0
Critical (15%)	0	0	84	65	101	3	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-23 shows Existing Conditions for average monthly Colusa Weir flow into the Sutter Bypass over the long term and by water year type. Colusa Weir flow into the Sutter Bypass ranges from 0 cfs (July to September) to 5,705 cfs (February). Refer to Appendix 6C for detailed tables of weir flows into the Sutter Bypass.

Table 6-23
Colusa Weir Monthly Flow into Sutter Bypass (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	8	133	1,336	3912	5,705	3,538	1,179	68	20	0	0	0
Water Year Types[b]												
Wet (32%)	0	35	1,281	9,969	1,4078	8,592	3,191	128	63	0	0	0
Above Normal (15%)	0	613	1,258	3,949	5885	5,033	1,043	186	0	0	0	0
Below Normal (17%)	46	70	1,688	716	1,245	104	88	0	0	0	0	0
Dry (22%)	0	94	2,064	225	755	271	0	0	0	0	0	0
Critical (15%)	0	0	28	13	13	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-24 shows Existing Conditions for average monthly flow into the Sutter Bypass from the Moulton Weir over the long term and by water year type. Moulton Weir flow into the Sutter Bypass ranges from 0 cfs (May to November) to 464 cfs (February). Refer to Appendix 6C for detailed tables of weir flows into the Sutter Bypass.

Table 6-24
Moulton Weir Monthly Flow into Sutter Bypass (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	0	0	57	289	464	242	32	0	0	0	0	0
Water Year Types[b]												
Wet (32%)	0	0	46	847	1,360	694	82	0	0	0	0	0
Above Normal (15%)	0	0	7	136	226	148	38	0	0	0	0	0
Below Normal (17%)	0	0	98	1	0	0	0	0	0	0	0	0
Dry (22%)	0	0	113	0	0	0	0	0	0	0	0	0
Critical (15%)	0	0	0	0	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-25 shows Existing Conditions average monthly flows into the Sutter Bypass from Ord Ferry over the long term and by water year type. Ord Ferry flow into the Sutter Bypass ranges from 0 cfs (May to November) to 427 cfs (February). Refer to Appendix 6C for detailed tables of weir flows into the Sutter Bypass.

Table 6-25
Ord Ferry Monthly Flow into Sutter Bypass (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	0	0	60	262	427	189	13	0	0	0	0	0
Water Year Types[b]												
Wet (32%)	0	0	37	795	1,204	555	34	0	0	0	0	0
Above Normal (15%)	0	0	1	64	310	88	18	0	0	0	0	0
Below Normal (17%)	0	0	128	0	0	0	0	0	0	0	0	0
Dry (22%)	0	0	121	0	0	0	0	0	0	0	0	0
Critical (15%)	0	0	0	0	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.16 Yolo Bypass

The Yolo Bypass is an approximately 59,000-acre land area that conveys Sacramento River flood waters around Sacramento during times of high runoff. Flow is diverted from the Sacramento River into the bypass when the stage exceeds 33.5 feet (corresponding to 56,000 cfs at Verona). Diversion of the majority of the Sacramento River, Sutter Bypass, and Feather River floodwaters to the Yolo Bypass controls Sacramento River flood stages at Verona. During large flood events, up to 80 percent of Sacramento River flows are diverted into the bypass. The Yolo Bypass parallels the lower Sacramento River reach to the west. Flows enter this river reach at various points. First, flows from the Natomas Cross Canal enter the Sacramento River approximately one mile downstream from the Feather River mouth. The American River flows into the Sacramento River in the City of Sacramento. When Sacramento River system flood flows are the highest, a portion of the flow is diverted into the Yolo Bypass at the Sacramento Weir, located approximately three miles upstream from the American River confluence in downtown Sacramento. At the downstream end, Yolo Bypass flows reenter the Sacramento River near Rio Vista. As the river enters the Delta, Georgiana Slough branches off from the mainstem of the Sacramento River, routing a portion of the flow into the central Delta.

Table 6-26 shows Existing Conditions for average monthly Yolo Bypass flow over the long term and by water year type. Flow in the Yolo Bypass is mostly related to weir spills from the Sacramento River, as described above. Some of the flow is from Westside streams, such as Cache Creek. Long-term average monthly flow in the Yolo Bypass ranges from a monthly low of 47 cfs (July) to 12,548 cfs (February). Refer to Appendix 6B for detailed tables of weir flows into the Yolo Bypass.

Table 6-26
Yolo Bypass Monthly Flow (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	145	404	3,317	9,687	12,548	8,298	2,428	267	120	47	102	82
Water Year Types[b]												
Wet (32%)	84	591	4,322	26,071	31,139	21,303	6,490	640	240	47	149	95
Above Normal (15%)	34	850	1,408	7,455	12,263	8,396	1,399	183	65	47	96	67
Below Normal (17%)	563	228	3,233	1,002	2,662	715	488	64	64	47	116	88
Dry (22%)	45	231	5,233	515	1,703	691	306	76	65	47	60	72
Critical (15%)	53	19	274	309	358	279	104	65	63	47	54	75

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.17 Folsom Lake and Lake Natoma

The Folsom Facilities were developed as an integral part of the CVP. The facilities consist of Folsom Lake, which is formed by Folsom Dam, and Lake Natoma, which is formed by Nimbus Dam.

Construction of Folsom Dam was completed in 1956 and impounds Folsom Lake. Total Folsom Lake storage capacity is approximately 1 MAF.

Folsom Lake is a multiple-purpose facility. It is managed to provide flood control, recreation, hydroelectric power generation, M&I water supply, Delta water quality protection, and minimum fish protection flows in the American River and the Sacramento-San Joaquin Delta. It is located on the American River approximately 15 miles northeast of the City of Sacramento, near the City of Folsom, and approximately 30 miles upstream of the confluence of the Sacramento and American rivers.

Nimbus Dam is located seven miles downstream from Folsom Dam and impounds Lake Natoma. Lake Natoma reregulates the releases made through the Folsom Power Plant. Lake Natoma has a storage capacity of approximately 8,760 acre-feet (Reclamation, 2011).

Flood control requirements and regulating criteria are specified by USACE and described in the *Folsom Dam and Lake, American River, California Water Control Manual* (USACE, 1987).

Since 1996, Reclamation has operated the facilities according to modified flood control criteria, which reserve 400,000 to 670,000 acre-feet of flood control space in Folsom Lake and in a combination of three upstream reservoirs. This flood control plan, which provides additional protection for the lower American River, is implemented through an agreement between Reclamation and Sacramento Area Flood Control Agency (SAFCA). The terms of the agreement allow some of the empty reservoir space in Hell Hole, Union Valley, and French Meadows reservoirs to be treated as if it were available in Folsom Lake.

Table 6-27 shows Existing Conditions for average end-of-month Folsom Lake storage over the long term and by water year type. The long-term average end-of-month storage in Folsom Lake ranges from 445,000 acre-feet (November) to 844,000 acre-feet (May). In Critical water years, storage in Lake Oroville is reduced by up to 53 percent in July (1,153,000 acre-feet), as compared to long-term average (2,426,000 acre-feet). Critical water year storage in Folsom Lake is reduced up to 54 percent in October (227,000 acre-feet), as compared to long-term average (489,000 acre-feet). Refer to Appendix 6B for Folsom Lake surface water elevation and area data tables

Table 6-27
Folsom Lake End-of-Month Storage (TAF)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	489	445	456	471	488	592	721	844	817	682	599	509
Water Year Types[b]												
Wet (32%)	599	510	509	520	502	633	794	966	966	877	770	606
Above Normal (15%)	544	487	505	518	529	642	796	968	947	757	688	573
Below Normal (17%)	577	529	516	508	540	637	788	932	912	719	650	594
Dry (22%)	401	402	417	436	497	592	708	782	720	559	467	431
Critical (15%)	227	225	281	326	345	401	433	443	400	329	280	251

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
TAF = thousand acre-feet

6.2.2.18 American River

Downstream of Folsom Lake, the river passes through an urbanized area that is buffered by a riparian park, known as the American River Parkway. The river flows approximately 31 miles from Folsom Lake to the river's confluence with the Sacramento River.

Table 6-28 shows Existing Conditions for average monthly American River flow downstream of Nimbus Dam over the long term and by water year type. The long-term average monthly flow in the American River downstream of Nimbus ranges from 1,601 cfs (October) to 5,173 cfs (February).

Table 6-28
American River Monthly Flow Downstream of Nimbus Dam (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	1,601	2,831	3,341	4,446	5,173	3,773	3,290	3,603	3,702	3,763	2,704	2,923
Water Year Types[b]												
Wet (32%)	1,689	4,010	3,687	8,765	9,244	6,089	5,300	6,157	6,003	4,102	3,530	4,518
Above Normal (15%)	1,581	2,854	2,950	4,718	6,355	5,426	3,547	3,885	3,431	4,606	2,645	3,448
Below Normal (17%)	1,907	3,365	4,164	2,313	4,291	2,423	3,113	2,936	2,861	4,588	2,521	2,403
Dry (22%)	1,531	1,867	4,056	1,686	1,879	2,210	1,774	1,807	2,460	3,454	2,581	1,869
Critical (15%)	1,177	1,077	946	1,445	1,140	1,021	1,160	1,263	1,830	1,686	1,368	1,130

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.19 Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta (Delta), located to the east of San Francisco Bay, is the point of confluence for the Sacramento and San Joaquin rivers. The Delta encompasses the legal limits of the Delta, as defined in California Water Code Section 12220. Water flows out of the Delta, into Suisun Bay, then San Pablo Bay, and finally San Francisco Bay before flowing to the Pacific Ocean. Salty ocean water and fresh river water commingle in the Delta, creating the largest estuary on the west coast of North America. Water from more than 40 percent of the State's land area flows into the Delta (Reclamation, 2009).

Hundreds of miles of waterways divide the Delta into islands, some of which are below sea level. The Delta relies on more than 1,000 miles of levees to protect these islands.

The Delta supports several beneficial uses, including water supply to local and south of Delta municipalities and agricultural uses; ecological support for fisheries, including wetlands and important habitat; in-Delta agriculture; flood management; water quality management; and a major conveyance for transporting fresh water from northern to southern portions of the State (Delta Vision Blue Ribbon Task Force, 2008). The Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for more than seven million acres of the most highly productive agricultural land in the world, providing approximately 45 percent of the nation's produce. However, many water projects, including export pumps for the SWP and CVP, diversions for Delta area and Bay area municipalities, and regional agricultural users, also divert Delta waters, and thereby influence Delta hydrology and water quality (Reclamation, 2009).

Operation of the CVP and SWP is coordinated according to their respective water right permits, and a series of other governing laws, regulations, and agreements that have been developed to ensure compliance with specific hydrology, water quality, and ecosystem requirements while meeting the water supply contract obligations. CVP and SWP operations are adjusted to meet Delta flow and water quality standards by increasing releases of stored water in project reservoirs, or altering export pumping, gate positions, and other Delta facility operations. Water Rights Decision 1641 and Order WR 2001-05 contain water right requirements for Reclamation and DWR to implement the Bay-Delta Water Quality Control Plan flow and water quality objectives. The Coordinated Operations Agreement defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and meet the water demands of senior water right holders. Depending on specific conditions of the fisheries populations and presence in the Delta each year, CVP/SWP exports can be restricted on a seasonal basis pursuant to biological opinions issued by the National Marine Fisheries Services (NMFS) and USFWS.

Flows through the Delta are maintained to meet Bay-Delta water quality standards arising from DWR's water rights permits. These standards are designed to meet several water quality objectives, such as salinity, Delta outflow, river flows, and export limits. The purpose of these objectives is to attain the highest water quality, which is reasonable, considering all demands being made on the Bay-Delta waters. In particular, they protect a wide range of fish and wildlife, including Chinook salmon, delta smelt, striped bass, and the habitat of estuarine-dependent species.

The primary factors that affect Delta hydrology are: (1) twice-daily tidal cycles, which result in inflow and outflow through the Delta and San Francisco Bay; (2) freshwater inflow from the Sacramento and San Joaquin rivers; and (3) water management activities, including SWP and CVP reservoir storage and releases, as well as water exports from the south Delta. Additionally, winds and salinity/freshwater mixing behaviors generate several secondary currents. Although these currents are generally of low velocity, they are significant in terms of transporting contaminants and mixing different sources of water.

The CVP and SWP are the largest Delta water users and exporters. Water is exported via pumping and aqueduct facilities located at Clifton Court Forebay, the Banks Pumping Plant, the Jones Pumping Plant, and the North Bay Aqueduct. Local agencies, such as Contra Costa Water District (CCWD), municipalities, private entities, and agricultural users also operate their own diversion programs and infrastructure.

The Delta includes approximately 540,000 acres of agricultural land which, during the summer irrigation season, is supplied by Delta surface water. Water use in the Delta region averages approximately 1.7 MAF per year with the majority of that going to agricultural uses. Most of the agricultural water is diverted directly by farmers through unscreened diversions pursuant to riparian or pre-1914 water rights. Agricultural users operate their own diversions at more than 1,800 locations and divert a net rate (total diversions minus return flows) estimated at over 4,000 cfs, for a total of approximately 1.5 MAF of water consumed annually. Agricultural return flows are collected by canal systems and pumped back into Delta waterways. Given the agricultural return flows, actual diversions exceed the net water consumed by 50 percent or more. There is also a small amount of urban water use, including diversions by CCWD, the City of Antioch, and industries along the Pittsburg-Antioch shoreline.

Table 6-29 shows Existing Conditions for average monthly Sacramento-San Joaquin Delta outflow over the long term and by water year type. The long-term average monthly Delta outflow ranges from 6,015 cfs (October) to 51,555 cfs (February).

The Delta Cross Channel (DCC) is a gated diversion channel in the Sacramento River near Walnut Grove and Snodgrass Slough. Flows into the DCC from the Sacramento River are controlled by two 60-foot by 30-foot radial gates. When the gates are open, water flows from the Sacramento River through the DCC to channels of the lower Mokelumne and San Joaquin rivers toward the interior Delta. The DCC operation improves water quality in the interior Delta by improving circulation patterns of good quality water from the Sacramento River toward Delta diversion facilities. Reclamation operates the DCC in the open position to (1) improve the transfer of water from the Sacramento River to the export facilities at the Banks and Jones pumping plants, (2) improve water quality in the southern Delta, and (3) reduce salt water intrusion rates in the western Delta. During the late fall, winter, and spring, the gates are often periodically closed to protect out-migrating salmonids from entering the interior Delta. In addition, whenever flows in the Sacramento River at Sacramento reach 20,000 to 25,000 cfs on a sustained basis, the gates are closed to reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates.

Table 6-29
Sacramento-San Joaquin Delta Monthly Flow (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	6,015	11,701	21,478	42,346	51,555	42,576	30,053	22,456	12,771	7,964	4,594	9,715
Water Year Types[b]												
Wet (32%)	8,619	18,566	25,599	84,561	95,616	78,190	54,405	41,030	23,448	11,450	5,315	19,675
Above Normal (15%)	5,987	13,440	19,292	47,769	60,267	53,235	31,967	24,235	11,822	9,555	4,000	11,797
Below Normal (17%)	5,993	9,661	26,644	21,818	35,261	22,901	21,757	16,044	8,050	7,081	4,000	3,456
Dry (22%)	4,088	6,895	22,691	14,543	20,879	19,756	14,036	10,412	6,622	5,040	4,744	3,284
Critical (15%)	3,318	4,677	6,886	11,113	12,402	11,937	9,076	5,978	5,316	4,233	4,093	3,000

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
cfs = cubic feet per second

Table 6-30 shows Existing Conditions for average monthly DCC flow over the long term and by water year type. The long-term average monthly flow in the DCC ranges from 3,371 cfs (May) to 7,701 cfs (July).

Table 6-30
Delta Cross Channel Monthly Flow (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	4,723	4,031	4,492	4,999	5,691	5,148	3,904	3,371	5,669	7,701	6,529	5,727
Water Year Types[b]												
Wet (32%)	4,670	4,184	4,913	7,566	8,385	7,381	5,860	5,077	6,583	7,701	6,718	5,350
Above Normal (15%)	5,116	4,335	4,509	5,922	6,760	6,681	4,282	3,629	5,492	8,474	6,770	8,100
Below Normal (17%)	5,104	4,279	5,043	3,841	4,923	3,910	3,165	2,687	5,594	8,141	6,632	5,743
Dry (22%)	4,612	3,798	4,324	3,119	3,645	3,578	2,545	2,276	5,233	7,689	6,993	5,497
Critical (15%)	4,164	3,455	3,175	2,686	2,752	2,575	2,190	1,859	4,610	6,429	5,061	4,500

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).
Note:
cfs = cubic feet per second

Water management activities, especially export pumping, can affect the direction of flow in Delta channels. Net flow of Delta waters is naturally westward from the San Joaquin and Sacramento rivers across the Delta and toward San Francisco Bay. However, during certain tidal, river inflow, and south Delta export pumping conditions, the direction of net flow within specific western Delta channels may be eastward (creating a reverse flow).

The combined Old and Middle river flows are used as a measure of net reverse flow conditions (exclusive of tides) downstream of the Jones and Banks pumping plants within the south Delta. CVP and SWP export pumping causes reverse flows in the southward direction down Old and Middle rivers and other central and south Delta channels. A negative flow value indicates reverse flow conditions.

Table 6-31 shows Existing Conditions for average monthly Old and Middle river flows over the long term and by water year type. The long-term average monthly flow in Old and Middle rivers ranges from -9,589 cfs (July) to 840 cfs (April). Positive flow values are shown in April and May for the long-term average and over all water years except for Dry and Critical. All other months and water years show negative flow values, which indicate reverse flows.

Table 6-31
Old and Middle Rivers Monthly Flow (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	-6,178	-6,084	-6,640	-3,473	-3,279	-2,779	840	352	-3,773	-9,589	-9,250	-7,582
Water Year Types[b]												
Wet (32%)	-6,294	-5,523	-6,886	-1,965	-2,581	-1,851	2,431	1,648	-4,166	-8,954	-10,070	-8,041
Above Normal (15%)	-6,718	-6,149	-7,623	-3,547	-3,286	-4,070	1,058	500	-4,840	-10,022	-10,452	-8,345
Below Normal (17%)	-7,414	-8,152	-6,550	-4,240	-3,434	-3,968	688	273	-4,056	-10,659	-9,892	-8,598
Dry (22%)	-6,008	-6,823	-6,158	-4,619	-4,004	-2,923	-295	-643	-3,286	-10,756	-9,988	-7,658
Critical (15%)	-4,200	-3,713	-5,952	-4,057	-3,517	-1,897	-947	-1,017	-2,254	-7,537	-4,415	-4,528

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

Table 6-32 shows Existing Conditions for average monthly Banks and Jones pumping plant export over the long term and by water year type. The long-term average monthly export at Banks and Jones pumping plants ranges from 2,083 cfs (April) to 10,510 cfs (July).

Table 6-32
Total Banks Pumping Plant (SWP) and Jones Pumping Plant (CVP) Monthly Export (cfs)
Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]	6,940	6,885	8,906	6,660	7,242	6,595	2,083	2,190	4,849	10,510	10,053	8,650
Water Year Types[b]												
Wet (32%)	7,323	6,603	10,095	7,856	9,480	9,319	2,847	3,298	7,398	11,371	11,478	9,539
Above Normal (15%)	7,566	6,896	9,652	6,442	7,241	7,721	1,819	1,675	6,156	10,777	11,289	9,445
Below Normal (17%)	8,258	9,017	8,887	6,291	6,885	6,753	1,736	1,666	4,204	10,977	10,594	9,676
Dry (22%)	6,612	7,510	7,816	6,247	5,802	4,333	1,750	1,759	2,890	10,913	10,580	8,551
Critical (15%)	4,437	4,060	7,241	5,338	4,970	2,779	1,594	1,560	1,709	7,230	4,307	4,880

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Note:
cfs = cubic feet per second

6.2.2.20 Suisun Bay, San Pablo Bay, and San Francisco Bay

San Francisco Bay is a shallow productive estuary through which water from the Sacramento and San Joaquin rivers enters the Pacific Ocean. Specifically, both rivers flow into Suisun Bay, which flows through the Carquinez Strait to meet with the Napa River at the entrance to San Pablo Bay. San Pablo Bay connects at its south end to San Francisco Bay. However, the entire group of interconnected bays is often referred to as the “San Francisco Bay”.

The outlet of San Francisco Bay at Golden Gate Bridge is located 74 km from Chipps Island, the interface between the Delta and Suisun Bay. The Suisun Marsh is located north of Suisun Bay and east of Carquinez Strait; it is an extensive mosaic of variably controlled tidal marshlands. Tributaries to San Pablo Bay include the Napa, Sonoma, and Petaluma rivers. Numerous lesser streams collectively drain the Bay Region.

San Francisco Bay has a surface area of approximately 400 square miles at mean tide level. Most of the Bay’s shoreline has a mild slope, which creates a relatively large intertidal zone. The volume of water in the Bay changes by approximately 21 percent from mean higher-high tide to mean lower-low tide. The overall average depth of the Bay is approximately 20 feet, with the Central Bay averaging 43 feet and the South Bay averaging 15 feet. San Francisco Bay is surrounded by approximately 130 square miles of tidal flats and marshes.

Average net Delta outflow into the Bay Region, as measured at Chipps Island, is approximately 20,400 cfs, or 15 MAF per year. Average natural freshwater inflow to the Delta varies by a factor of more than 10 between the highest month in winter or spring and the lowest month in fall. During summer months of Critically Dry water years, net Delta outflow can decrease to 3,000 cfs.

In addition to Delta outflow, San Francisco Bay receives freshwater inflow from the Napa, Petaluma, and Guadalupe rivers, and from Alameda, Coyote, Walnut, and Sonoma creeks, as well as several smaller streams. The total average annual inflow volume of these tributaries (excluding the Delta) is approximately 350,000 acre-feet. Stream flow is highly seasonal, with more than 90 percent of the annual runoff occurring during November through April.

Suisun Bay and the adjacent 80,000-acre Suisun Marsh are located near the downstream end of the Delta. Suisun Bay is the area where the effects of mixing fresh water and salt water are typically most pronounced.

Downstream of Carquinez Strait are the San Pablo and central San Francisco bays. Carquinez Strait separates these bays from Suisun Bay and the Delta, and allows tides to play a leading role in their salinity and circulation. These embayments can become fresh, especially at the surface, during extremely high freshwater flows. During these high flows, the entrapment zone can be temporarily relocated downstream to San Pablo Bay. During periods of low freshwater flows and high tides, these embayments are saline.

The South Bay is different from the other parts of the system. This area is not in the main path of Delta outflows. Thus, except during sustained high-outflow periods, water quality is not significantly affected by Delta outflow. During low Delta outflow periods, evaporation, combined with limited tidal flushing, can cause salinity levels to be higher in the South Bay than in the ocean outside of the Golden Gate.

The Bay Region receives unallocated and minimum required outflows from the Delta Region. These can range from the minimum required flow of less than four to nearly 60 MAF, depending on precipitation and diversions. This water is used in the Bay Region primarily for ecological and water quality maintenance purposes.

The location of the mixing zone between fresh water from the Delta and saline water from the Bay varies with the amount of Delta outflow, as well as tides. The mixing zone is pushed downstream during periods of high Delta outflow and can move upstream into the Delta if Delta outflow is low, or during spring neap tides.

To track and regulate this movement, a standard has been developed, called X2, which represents the mean distance in kilometers (km) from the Golden Gate Bridge where salinity concentration and electrical conductivity requirements are met. The X2 position approximates the location of the entrapment zone, which is an area of high biological productivity.

The Water Quality Control Plan (WQCP) for the San Francisco Bay/Sacramento-San Joaquin Delta defines requirements for maintaining X2 at Port Chicago and Chipps Island (SWRCB, 1999).

6.2.3 Primary Study Area

The Primary Study Area is considered to be the footprint of the Project facilities, the land immediately surrounding them that could be affected by construction and/or maintenance activities (construction disturbance area), and the land parcels surrounding those areas that would be purchased as a Project buffer.

The Primary Study Area is located entirely within Glenn and Colusa counties. The primary surface water resources in this study area are Funks Creek, Stone Corral Creek, Funks Reservoir, CBD, and other small tributaries. They are discussed below.

6.2.3.1 Funks Creek

Funks Creek headwaters begin in the foothills west of the town of Maxwell. Funks Creek flows into Funks Reservoir at the T-C Canal, both of which are operated by TCCA. The drainage area of Funks Creek at Funks Dam is 43 square miles. The last stream gage that was operated on Funks Creek washed out in 1985 and was not replaced due to the constantly degrading channel. Peak winter flows of approximately 2,000 cfs are common (Weathers, pers. comm., 2005). Because the topography and soil composition of the watershed are similar to those of Stone Corral Creek, where stream flow records are available, and given the comparable drainage areas of the two watersheds, it is reasonable to assume that the 100-year discharge on Funks Creek would be similar to that of Stone Corral Creek.

6.2.3.2 Stone Corral Creek

The drainage area of the Stone Corral Creek watershed is 38.2 square miles. The USGS collected 25 years of discharge measurements near the town of Sites from 1958 through 1985 with periodic interruptions. During that time, there were three years of zero flow: 1972, 1976, and 1977. The maximum mean daily flow of 2,230 cfs occurred on December 24, 1983. The instantaneous peak flow was 5,700 cfs on January 26, 1983. The 100-year discharge upstream of Sutton Road (aka Cemetery Road) is 3,560 cfs. A summary of the flow statistics is shown in Table 6-33 (FEMA, 2003).

Table 6-33
Stone Corral Creek Daily and Monthly Flows Near Sites, USGS 11390672
Period of Record 4/1/1958 – 9/30/1964 and 10/1/1965 – 9/30/1985
Drainage Area = 38.2 Square Miles

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Daily Flows for Period of Record (cfs)												
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	74	2,230	1,910	2,150	1,980	619	45	9	1	0	0
Avg	0	1	11	32	39	21	8	1	0	0	0	0
Monthly Flows (Acre-Feet) for Period of Record												
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	427	11,432	8,825	11,137	15,227	4,451	740	146	19	0	0
Avg	0	37	660	1,946	2,190	1,300	484	83	13	1	0	0

Note:
cfs = cubic feet per second

6.2.3.3 Funks Reservoir

Funks Reservoir is located on Funks Creek approximately seven miles northwest of the town of Maxwell, in Colusa County. Constructed in 1975 by Reclamation, Funks Reservoir has a designed storage capacity of approximately 2,200 acre-feet with a surface area of 232 acres. The T-C Canal connects to Funks Reservoir with an inlet at the northeast end adjacent to the dam spillway and an outlet to the southeast end. Both the inlet and outlet have a gated release. The Funks Reservoir spillway is designed to pass 25,000 cfs. Both Funks Reservoir and the T-C Canal are operated and maintained by TCCA (Reclamation, 2012).

The typical summer releases from Funks Reservoir to the lower portions of T-C Canal range from 500 cfs to 1,000 cfs. Total flows of 50 cfs to 200 cfs for off-peak limited agricultural releases are needed between November and February, and possibly into March, depending on the weather (DWR, 2003).

6.2.3.4 Colusa Basin Drain

Runoff from 11 stream systems draining the foothill and valley floor watersheds contribute flow to the CBD. The CBD flows southward through Glenn, Colusa, and Yolo counties and enters the Sacramento River at the town of Knights Landing. This natural historic drainage system for the Colusa Basin has been almost entirely cut off from receiving floodwaters from the Sacramento River by an extensive levee system (except when flood flows on the Sacramento River exceed 300,000 cfs near Ord Ferry). In general, the CBD conveys flood flows from November through March, and agricultural irrigation and drainage flows from April through October. The northern half of the CBD is unleveed. Beginning south of Colusa, left bank (looking downstream) levees extend southward to the CBD’s confluence with the Sacramento River. A DWR gaging station located at State Route (SR) 20 near the City of Colusa has been operating since 1924. The drainage area at SR 20 is 973 square miles, and the average annual runoff is 497,000 acre-feet. A summary of the flow statistics is shown in Table 6-34.

Table 6-34
Colusa Basin Drain Daily and Monthly Flows at Highway 20
Period of Record 11/1/1944 - 9/30/1994
Drainage Area = 973 square miles

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean Daily Flows for Period of Record (cfs)												
Min	0	62	22	64	22	44	0	0	0	0	0	0
Max	2,352	2,680	11,300	10,800	23,900	15,300	3,260	2,390	2,620	1,560	2,230	7,287
Avg	289	434	554	894	1,016	606	425	820	578	624	896	942
Monthly Flows (TAF) for Period of Record												
Min	0	7	4	6	3	6	5	10	7	4	11	5
Max	37	77	223	192	387	326	96	81	65	81	97	88
Avg	18	26	34	55	57	37	25	50	34	38	55	56

Source: DWR, 2013.

6.2.3.5 Other Local Creeks

Numerous small tributaries exist within the Primary Study Area. Grapevine Creek starts on the west side of the proposed Sites Reservoir inundation area and flows north and into the reservoir area near Sites Lodoga Road. It also flows into Funks Creek approximately seven miles upstream of Funks Reservoir. Antelope Creek starts on the west side of the proposed reservoir inundation area, south of the headwaters of Grapevine Creek. Antelope Creek flows south, then east, and then north through the southern portion of the proposed reservoir inundation area, and joins with Stone Corral Creek near the town of Sites. North of the Sites Reservoir inundation area, Hunters Creek flows to the east. Southeast of Sites Reservoir, Lurline Creek flows to the east. Both Hunters and Lurline creeks flow into the CBD.

6.3 Evaluation of Changes to Surface Water Resources

6.3.1 Regulatory Setting

Surface water resources are regulated at the federal, State, and local levels through regulations that pertain to water quality, flood control, protection of fish and wildlife, power generation, the beneficial uses of water, water rights, and regulations that define the sharing of water between the CVP and SWP. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

6.3.1.1 Federal Plans, Policies, and Regulations

- Central Valley Project Improvement Act
- Coordinated Operations Agreement
- 2009 National Marine Fisheries Service Biological Opinion
- Bay-Delta Water Quality Control Plan
- CALFED Bay-Delta Authorization Act
- CALFED Bay-Delta Implementation Act
- Trinity River Mainstem Fishery Restoration

- San Joaquin River Agreement and the Vernalis Adaptive Management Plan
- Clean Water Act

6.3.1.2 State Plans, Policies, and Regulations

- State Water Resources Control Board Water Rights and Water Quality Protection
  - Water Rights Protections for County of Origin and Upstream Watersheds
- Water Rights Decision 1422/Order 83-3 and Water Rights Decision 1275
- Water Quality Control Plans for the Sacramento/San Joaquin River Basins, the San Francisco Bay Basin, and Development of the 1978 Delta Plan and Water Rights Decision 1485
- Development of the 1995 and 2006 Water Quality Control Plans and Orders 98-09 and 95-9
- State Water Resources Control Board Decision 1641
- Porter-Cologne Water Quality Control Act
- The Burns-Porter Act
- Delta Protection Act of 1959
- Delta Protection Act of 1992
- Monterey Agreement
- Monterey Plus
- Suisun Marsh Protection Act and Plan (1974)
- Suisun Marsh Preservation Agreement (1987)
- California Water Plan

6.3.2 Assessment Assumptions and Methodology

The following assumptions and methods were used to describe the changes in surface water resources associated with implementation of the No Project/No Action Alternative and Alternatives A, B, and C.

6.3.2.1 Key Assumptions Associated with the No Project/No Action Alternative

Below is a summary of key assumptions included in the No Project/No Action Alternative, which directly influence the changes in surface water resource metrics between the No Project/No Action Alternative and Existing Conditions. A more detailed explanation of key assumptions between alternatives can be found in Appendix 6A.

- An increase in demands and build-out of facilities associated with CVP contracts of approximately 253,000 acre-feet per year north of the Delta at the future level of development. This is a result of an increase in CVP M&I service contracts related primarily to urban M&I use within the American River Basin (198,000 acre-feet), especially in the communities in El Dorado, Placer, and Sacramento counties. A summary of the CVP demands between the No Project/No Action Alternative and the Existing Conditions is shown in Table 6-35.

- An increase in demands associated with SWP contracts, up to full contract amounts, south of the Delta at the future level of development. SWP M&I demands, which with the existing level of development, vary on hydrologic conditions between 3.0 to 4.1 MAF per year, and with the future condition are at maximum contract amounts in all hydrologic conditions. This represents a potential 25 percent increase on average in south of the-Delta demands pursuant to SWP M&I contracts between existing and future levels of development. A summary of the SWP demands between the No Project/No Action Alternative and the Existing Conditions is shown in Table 6-35.
- An increase in non-Project water rights demand of 184,000 acre-feet in the American River Basin.
- New urban intake/Delta export facilities include:
  - Freeport Regional Water Project (FRWP)
  - City of Stockton Delta Water Supply Project, 30 mgd capacity
  - Delta-Mendota Canal – California Aqueduct Intertie
  - Contra Costa Water District's Middle River Intake and Pump Station (previously known as the Alternative Intake Project) and Los Vaqueros expanded storage capacity, 160,000 acre-feet
  - South Bay Aqueduct rehabilitation, to 430 cfs capacity, from junction with California Aqueduct to Alameda County FCWSD Zone 7
- An increase in supplies firm Level 2 for wildlife refuges of approximately 32,000 acre-feet per year north of the Delta and a decrease of approximately 24,000 acre-feet south of the Delta and an increase of Level 4 supplies of for wildlife refuges of approximately 50,000 acre-feet per year (17,000 acre-feet north of the Delta and 33,000 acre-feet south of the Delta) at the future level of development. However, Firm Level 2 supplies are met by CVP contract supply and Level 4 supplies are met through local water acquisitions in both existing and future levels of development.
- Both Existing Conditions and the No Project/No Action Alternative modeling assumptions reflect the best representation of the Reasonable and Prudent Actions (RPAs) in the 2008 U.S. Fish and Wildlife Service (USFWS) and 2009 NOAA National Marine Fisheries Service (NMFS) Biological Opinions (BiOps).
  - USFWS BiOp RPA actions considered include:
    - Action 1: Adult Delta smelt migration and entrainment (RPA Component 1, Action 1 – First Flush)
    - Action 2: Adult Delta smelt migration and entrainment (RPA Component 1, Action 2)
    - Action 3: Entrainment protection of larval and juvenile Delta smelt (RPA Component 2)
    - Action 4: Estuarine habitat during Fall (Fall X2 Action) (RPA Component 3)
    - Action 5: Temporary spring head of Old River barrier and the Temporary Barrier Project (RPA Component 2)
  - NMFS BiOp RPA actions considered include:
    - Action I.1.1: Clear Creek spring attraction flows
    - Action I.3.1: Operations after May 14, 2012: Operate RBDD with Gates Out

- Action I.4: Wilkins Slough operations
- Action II.1: Lower American River flow management
- Action III.1.3: Stanislaus River flows downstream of Goodwin Dam
- Action IV.1.2: Delta Cross Channel gate operations
- Action IV.2.1: San Joaquin River flow requirements at Vernalis and Delta export restrictions
- Action IV.2.3: Old and Middle River flow management

Table 6-35 shows a summary of CVP and SWP demands for Existing Conditions and the No Project/No Action Alternative grouped by north-of-the-Delta and south-of-the-Delta regions. Key differences in project demands are reflected in the changes seen between Existing Conditions and the No Project/No Action Alternative. For a general discussion of the CVP and SWP project contractors and demands, refer to Section 6.2.1.2.

Table 6-35
Summary of CVP and SWP Demands (TAF/Year)
No Project/No Action Alternative Compared to Existing Conditions

	Summary of SWP and CVP Demands under Existing Conditions		Summary of SWP and CVP Demands under No Project/No Action Alternative	
Project Contractor Type	**North-of-the-Delta**	**South-of-the-Delta**	**North-of-the-Delta**	**South-of-the-Delta**
CVP Contractors				
Settlement/Exchange	2,194	840	2,194	840
Water Service Contracts				
Agriculture (Ag)	378	1,937	378	1,937
Municipal and Industrial (M&I)	304	164	557 (+253)	164
Level 2 Refuge Supplies	157	305	189 (+32)	281 (-24)
SWP Contractors				
Feather River Service Area (FRSA)	983	0	983	0
Table A	108	4,056	114 (+6)	4,056
Agriculture (Ag)	0	1,048	0	1,032 (-16)
Municipal and Industrial (M&I)	108	3,008	114 (+6)	3,024 (+16)

Notes:
SWP = State Water Project
CVP = Central Valley Project
TAF = thousand acre-feet

6.3.2.2 Methodology

Analyses to support the description of changes to surface water resources associated with implementation of the alternatives were developed based upon CALSIM II operations simulations. CALSIM II is the DWR and Reclamation operations simulation model developed for the CVP and SWP water resources system. CALSIM II is described in Appendix 6B.

The use of CALSIM II allows Project planners to describe the comparative changes or effects to the CVP and SWP water resources system associated with adding a new surface storage reservoir located north of the Delta. For the simulation of Existing Conditions, all characteristics of the CVP and SWP remained the same. For the simulation of the No Project/No Action Alternative, reasonably foreseeable projects and changes (such as increasing demands) were added to the Existing Conditions baseline. Subsequently, simulations of the CVP and SWP were performed with the addition of Project action alternatives A, B, and C to facilitate a comparison of surface water resources with and without the proposed Project.

The metrics chosen to evaluate differences between Existing Conditions, the No Project/No Action Alternative, and Alternatives A, B, and C were for those locations at which a relative change could occur due to implementation of the alternatives. In addition, one metric was chosen to represent changes at each evaluation location discussed. For example, storage was chosen to represent changes at reservoirs, although reservoir surface water elevation and surface area changes were also modeled.

Detailed data of all surface water resources modeling locations and metrics are included in Appendix 6B. In addition, maps showing the specific locations used for surface water and surface water quality modeling are included in Appendix 6B.

6.3.3 Topics Eliminated from Further Analytical Consideration

Metrics at several modeled locations were omitted from discussion throughout this chapter where it would have been redundant to represent changes resulting from implementation of the alternatives, or where no change would be expected to occur from implementation of the alternatives.

6.3.4 Changes Associated with the No Project/No Action Alternative

This section describes changes between the No Project/No Action Alternative and Existing Conditions. Environmental effects associated with the changes described below are discussed in other resources chapters.

6.3.4.1 Extended Study Area – No Project/No Action Alternative

San Luis Reservoir

Table 6-36 shows the differences between the No Project/No Action Alternative and the Existing Conditions for monthly San Luis Reservoir storage. Table 6-36 presents data for averages over the long term and by water year types.

Over the long term, storage would be reduced in most months, when compared to Existing Conditions. Small increases would occur in February, March, and April. Larger reductions in storage would occur in May through January. The largest reduction in storage (6.6 percent) would occur in November. The greatest storage reductions would occur in Wet water years, and the greatest storage increases would occur in Critical water years with June through November, all increasing by more than 20 percent (roughly 100,000 acre-feet or more). The largest reduction (18.4 percent) would occur in August of Wet water years, and the largest increase by water year type (30.7 percent) would occur in September of Critical water years.

Table 6-36
San Luis Reservoir End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	697	840	1,175	1,338	1,469	1,553	1,324	1,001	682	603	548	617
No Project/No Action Alternative	653	784	1,113	1,328	1,477	1,572	1,332	992	668	583	513	584
Difference	-44	-55	-62	-10	8	19	8	-9	-14	-20	-34	-34
Percent Difference (%)	-6.3	-6.6	-5.3	-0.7	0.5	1.2	0.6	-0.9	-2.1	-3.4	-6.3	-5.5
Water Year Types[b]												
Wet (32%)												
Existing Condition	912	950	1,290	1,481	1,673	1,848	1,611	1,301	1,028	895	810	879
No Project/No Action Alternative	766	797	1,124	1,407	1,600	1,772	1,510	1,168	893	743	661	741
Difference	-147	-153	-167	-74	-73	-76	-101	-133	-135	-152	-149	-138
Percent Difference (%)	-16.1	-16.1	-12.9	-5.0	-4.3	-4.1	-6.3	-10.2	-13.1	-17.0	-18.4	-15.7
Above Normal (15%)												
Existing Condition	643	758	1,123	1,215	1,346	1,496	1,241	883	621	499	448	546
No Project/No Action Alternative	616	701	1,052	1,265	1,400	1,544	1,265	874	587	463	433	528
Difference	-27	-57	-71	49	55	49	24	-8	-33	-35	-15	-18
Percent Difference (%)	-4.3	-7.5	-6.4	4.1	4.1	3.3	1.9	-0.9	-5.4	-7.1	-3.3	-3.4
Below Normal (17%)												
Existing Condition	732	1,025	1,367	1,352	1,448	1,518	1,267	903	537	489	444	568
No Project/No Action Alternative	651	932	1,265	1,329	1,459	1,541	1,278	894	519	464	417	517
Difference	-81	-93	-102	-23	11	24	11	-9	-18	-25	-27	-51
Percent Difference (%)	-11.1	-9.0	-7.4	-1.7	0.8	1.6	0.9	-1.0	-3.3	-5.1	-6.2	-9.0
Dry (22%)												
Existing Condition	577	801	1,104	1,340	1,431	1,425	1,183	831	416	398	426	489
No Project/No Action Alternative	587	792	1,088	1,358	1,487	1,508	1,269	916	507	492	455	511
Difference	10	-9	-16	18	56	83	86	85	92	95	29	22
Percent Difference (%)	1.8	-1.1	-1.4	1.4	3.9	5.8	7.2	10.2	22.1	23.8	6.8	4.5
Critical (15%)												
Existing Condition	425	523	860	1,132	1,231	1,207	1,064	842	560	518	381	370
No Project/No Action Alternative	548	654	1,010	1,177	1,291	1,300	1,169	959	673	631	472	484
Difference	123	131	150	46	61	93	105	117	113	113	91	114
Percent Difference (%)	29.0	25.1	17.4	4.0	4.9	7.7	9.9	13.9	20.2	21.9	23.9	30.7

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
Percent Difference (%) = Relative Difference of the monthly average.
TAF = thousand acre-feet

CVP Deliveries

No Project/No Action Alternative vs. Existing Conditions

Table 6-37 shows the differences between the No Project/No Action Alternative and Existing Conditions for annual CVP deliveries within the Extended Study Area by hydrologic region and water service type. Table 6-37 presents data for the long-term averages and combined Dry and Critical water years average.

Table 6-37
Annual CVP Deliveries (TAF)[a]
No Project/No Action Alternative (NPA/NAA) Compared to Existing Conditions (EXC)
Long-Term Average and Combined Dry and Critical Years Average

Region and Delivery Type		Average (Annual)	NPA/NAA (TAF)	EXC (TAF)	NPA/NAA – EXC (TAF) (Percent Change)
Sacramento River Hydrologic Region					
CVP Settlement	Contract Delivery	Long-Term[b]	1,934	1,908	26 (1%)
		Dry and Critical[c]	1,918	1,895	23 (1%)
CVP Refuge Level 2	Contract Delivery	Long-Term	155	129	26 (20%)
		Dry and Critical	137	115	22 (19%)
Refuge Level 4	Supply from acquisitions	Long-Term	27	10	17 (170%)
		Dry and Critical	25	10	16 (165%)
CVP M&I	Contract Delivery	Long-Term	211	85	126 (149%)
		Dry and Critical	174	74	100 (135%)
CVP Ag	Contract Delivery (does not include Settlement contractors)	Long-Term	213	223	-10 (-5%)
		Dry and Critical	93	112	-19 (-17%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)					
CVP Exchange	Contract Delivery	Long-Term	852	852	0 (0%)
		Dry and Critical	814	814	0 (0%)
CVP Refuge Level 2	Contract Delivery	Long-Term	261	281	-20 (-7%)
		Dry and Critical	249	267	-18 (-7%)
Refuge Level 4	Supply from acquisitions	Long-Term	86	62	24 (39%)
		Dry and Critical	82	59	23 (39%)
CVP M&I	Contract Delivery	Long-Term	16	16	0 (0%)
		Dry and Critical	13	13	0 (0%)
CVP Ag	Contract Delivery (does not include Exchange contractors)	Long-Term	290	289	1 (0%)
		Dry and Critical	137	148	-11 (-7%)
San Francisco Bay Hydrologic Region					
CVP M&I	Contract Delivery	Long-Term	290	225	65 (29%)
		Dry and Critical	318	224	94 (42%)
CVP Ag	Contract Delivery	Long-Term	36	35	1 (1%)
		Dry and Critical	17	18	-1 (-7%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)					
CVP Refuge Level 2	Contract Delivery	Long-Term	12	15	-3 (-21%)
		Dry and Critical	11	14	-3 (-21%)
Refuge Level 4	Supply from acquisitions	Long-Term	20	12	8 (67%)
		Dry and Critical	20	11	9 (77%)
CVP Ag	Contract Delivery (includes Cross Valley Canal)	Long-Term	599	600	-1 (0%)
		Dry and Critical	283	307	-24 (-8%)
Total For All Regions					
Total CVP Supplies	Contract Delivery (Settlement, Ag, M&I and Refuges from CVP – does not include Refuge Level 4 supply from acquisitions)	Long-Term	4,868	4,659	209 (4%)
		Dry and Critical	4,164	4,001	163 (4%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

Ag = Agricultural
CVP = Central Valley Project
EXC = existing conditions
M&I = Municipal and Industrial
TAF = thousand acre-feet

The total deliveries for all regions over the long-term average show that an increase of 209,000 acre-feet (four percent) would occur. By hydrologic region, the long-term average shows that substantial M&I increases would occur in the Sacramento and San Francisco Bay regions. M&I deliveries in the Sacramento River hydrologic region would increase by 126,000 acre-feet (149 percent). This increase is due primarily to increase in urban M&I use within the American River Basin. To a lesser extent, M&I deliveries would also increase by 65,000 acre-feet (29 percent) in the San Francisco Bay Region. The only noticeable change in Ag deliveries would be a reduction (10,000 acre-feet [5 percent]) in the Sacramento Region. Wildlife Refuge Level 2 deliveries would also decrease in both the San Joaquin (20,000 acre-feet [7 percent]) and Tulare Lake (3,000 acre-feet [21 percent]) regions. Sacramento Hydrologic Region CVP settlement contractors' deliveries would increase by 23,000 acre-feet (one percent). San Joaquin River Exchange contractors' deliveries would remain the same.

The total deliveries throughout all hydrologic regions for the combined Dry and Critical water years average show that an increase of 163,000 acre-feet (four percent) would occur. Examining the Dry and Critical water years average by region indicates that substantial reliability improvements would occur with similar M&I delivery increases in the Sacramento (100,000 acre-feet [135 percent]) and San Francisco Bay (94,000 acre-feet [42 percent]) regions. Ag deliveries show that reductions would occur in all four regions, ranging from 7 percent (11,000 acre-feet) in the San Joaquin River and San Francisco Bay regions to 17 percent (19,000 acre-feet) in the Sacramento River region. Sacramento Hydrologic Region CVP settlement contractors' deliveries would increase by 26,000 acre-feet (one percent). San Joaquin River Exchange contractors' deliveries would remain the same.

SWP Deliveries

No Project/No Action Alternative vs. Existing Conditions

Table 6-38 shows the differences between the No Project/No Action Alternative and Existing Conditions for SWP deliveries by hydrologic region and water service type. Table 6-38 presents data for the long-term averages and combined Dry and Critical water years average.

The total deliveries for all regions over the long-term average show that an increase of 21,000 acre-feet (one percent) would occur. The long-term averages indicate that M&I delivery increases in the San Francisco Bay (9,000 acre-feet [four percent], South Coast (48,000 acre-feet [four percent]) and South Lahontan (6,000 acre-feet [two percent]) regions would occur, while all other M&I deliveries would decrease.

The total deliveries throughout all hydrologic regions for the combined Dry and Critical water years average shows that a reduction of 134,000 acre-feet (five percent) would occur. Dry and Critical water years averages show M&I reductions for all regions, with the largest reductions occurring in the South Coast (57,000 acre-feet [five percent]), San Francisco Bay (16,000 acre-feet [10 percent]) and South Lahontan (23,000 acre-feet [10 percent]) regions. Dry and Critical water years averages also show that Ag reductions would occur in the Tulare Lake (32,000 acre-feet [six percent]) region.

Table 6-38
Annual SWP Deliveries (TAF)[a]
No Project/No Action Alternative (NPA/NAA) Compared to Existing Conditions (EXC)
Long-Term Average and Combined Dry and Critical Years Average

Region and Delivery Type		Average (Annual)	NPA/NAA (TAF)	EXC (TAF)	NPA/NAA – EXC (TAF) (Percent Change)
Sacramento River Hydrologic Region					
SWP FRSA	Contract Delivery	Long-Term[b]	950	948	2 (0%)
		Dry and Critical[c]	901	899	2 (0%)
SWP M&I	Contract Delivery	Long-Term	23	24	-1 (-4%)
		Dry and Critical	16	17	-1 (-6%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)					
SWP Ag	Contract Delivery (including Article 21)	Long-Term	4	4	0 (0%)
		Dry and Critical	3	3	0 (0%)
San Francisco Bay Hydrologic Region					
SWP M&I	Contract Delivery (including Article 21, includes transfers to SWP contractors)	Long-Term	199	190	9 (4%)
		Dry and Critical	142	158	-16 (-10%)
Central Coast Hydrologic Region					
SWP M&I	Contract Delivery	Long-Term	44	45	-1 (-3%)
		Dry and Critical	31	35	-4 (-11%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)					
SWP M&I	Contract Delivery	Long-Term	84	87	-3 (-3%)
		Dry and Critical	60	62	-2 (-5%)
SWP Ag	Contract Delivery (including Article 21)	Long-Term	658	695	-37 (-5%)
		Dry and Critical	460	492	-32 (-6%)
South Lahontan Hydrologic Region					
SWP M&I	Contract Delivery (including Article 21)	Long-Term	267	261	6 (2%)
		Dry and Critical	197	220	-23 (-10%)
South Coast Hydrologic Region					
SWP M&I	Contract Delivery (including Article 21, includes transfers to SWP contractors)	Long-Term	1,353	1,305	48 (4%)
		Dry and Critical	990	1,047	-57 (-5%)
SWP Ag	Contract Delivery (including Article 21)	Long-Term	8	9	-1 (-3%)
		Dry and Critical	6	6	0 (0%)
Total For All Regions					
Total SWP Supplies	Contract Delivery (FRSA, Ag, and M&I from SWP)	Long-Term	3,589	3,568	21 (1%)
		Dry and Critical	2,804	2,938	-134 (-5%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

Ag = Agricultural
EXC = existing conditions
FRSA = Feather River Service Area
M&I = Municipal and Industrial
SWP = State Water Project
TAF = thousand acre-feet

6.3.4.2 Secondary Study Area – No Project/No Action Alternative

Trinity Lake

Table 6-39 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Trinity Lake storage. It presents data for averages over the long term and by water year types.

Table 6-39
Trinity Lake End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	1,306	1,314	1,366	1,427	1,537	1,659	1,807	1,803	1,767	1,631	1,494	1,373
No Project/No Action Alternative	1,305	1,315	1,367	1,431	1,541	1,665	1,816	1,810	1,774	1,636	1,495	1,374
Difference	-1	1	1	4	4	6	9	8	7	5	1	1
Percent Difference (%)	-0.1	0.1	0.0	0.3	0.2	0.4	0.5	0.4	0.4	0.3	0.1	0.1
Water Year Types[b]												
Wet (32%)												
Existing Condition	1,738	1,746	1,764	1,753	1,913	2,047	2,224	2,260	2,239	2,111	1,997	1,845
No Project/No Action Alternative	1,736	1,745	1,761	1,749	1,911	2,051	2,229	2,264	2,241	2,114	1,994	1,845
Difference	-2	-2	-4	-3	-2	4	5	4	2	3	-3	0
Percent Difference (%)	-0.1	-0.1	-0.2	-0.2	-0.1	0.2	0.2	0.2	0.1	0.2	-0.2	0
Above Normal (15%)												
Existing Condition	1,547	1,542	1,571	1,523	1,676	1,845	2,015	2,020	1,992	1,869	1,736	1,601
No Project/No Action Alternative	1,535	1,530	1,557	1,518	1,667	1,837	2,007	2,012	1,984	1,860	1,722	1,584
Difference	-12	-12	-13	-5	-9	-8	-8	-8	-8	-8	-15	-17
Percent Difference (%)	-0.8	-0.8	-0.9	-0.3	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.8	-1.1
Below Normal (17%)												
Existing Condition	1,211	1,245	1,328	1,316	1,390	1,487	1,658	1,643	1,598	1,466	1,335	1,232
No Project/No Action Alternative	1,222	1,254	1,338	1,325	1,399	1,496	1,672	1,656	1,609	1,479	1,344	1,241
Difference	11	9	10	9	9	9	14	13	11	13	9	8
Percent Difference (%)	0.9	0.7	0.7	0.7	0.7	0.6	0.8	0.8	0.7	0.9	0.7	0.7
Dry (22%)												
Existing Condition	1,070	1,074	1,182	1,322	1,405	1,533	1,664	1,615	1,552	1,404	1,235	1,127
No Project/No Action Alternative	1,068	1,078	1,186	1,334	1,414	1,542	1,680	1,630	1,571	1,411	1,243	1,132
Difference	-2	4	4	11	8	9	16	15	18	8	8	5
Percent Difference (%)	-0.2	0.4	0.3	0.9	0.6	0.6	1.0	0.9	1.2	0.6	0.7	0.5
Critical (15%)												
Existing Condition	595	589	621	913	952	1,023	1,083	1,062	1,040	886	734	653
No Project/No Action Alternative	595	596	629	924	966	1,039	1,099	1,076	1,050	893	741	658
Difference	0	7	8	11	15	16	16	15	10	8	7	5
Percent Difference (%)	0	1.3	1.2	1.2	1.6	1.5	1.5	1.4	0.9	0.9	0.9	0.8

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
Percent Difference (%) = Relative Difference of the monthly average.
TAF = thousand acre-feet

The long-term average shows that slight changes would occur, with the greatest change being an increase (0.5 percent) in April. By water year type, storage generally would increase during drier years, with a maximum increase (1.6 percent) occurring during February of Critical water years.

Lewiston Lake

For the purposes of evaluation, Lewiston Lake is assumed to continue to operate as it has historically (as a regulating reservoir). As a regulating reservoir, Lewiston Lake is operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs and diversions through the Clear Creek Tunnel to Whiskeytown Lake. Water levels in the reservoir vary over a day and over the span of a week. The regulating operations of Lewiston Lake or Whiskeytown Lake would not be significantly changed by the Project. The modeling performed considered only flow variations on a monthly basis.

Trinity River

Table 6-40 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Trinity River flow downstream of Lewiston Lake. It presents data for averages over the long term and by water year types.

Table 6-40
Trinity River Monthly Flow Downstream of Lewiston Lake (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	368	365	523	662	644	617	583	3,779	2,108	923	450	450
No Project/No Action Alternative	368	360	522	655	645	575	554	3,779	2,091	923	450	450
Difference	0	-4	-2	-8	1	-42	-28	0	-17	0	0	0
Percent Difference (%)	0	-1.1	-0.3	-1.1	0.1	-6.7	-4.8	0	-0.8	0	0	0
Water Year Types[b]												
Wet (32%)												
Existing Condition	373	300	856	1,436	1,056	1,227	716	4,636	3,371	1,289	450	450
No Project/No Action Alternative	373	300	852	1,412	1,026	1,096	627	4,636	3,318	1,289	450	450
Difference	0	0	-5	-24	-30	-131	-89	0	-53	0	0	0
Percent Difference (%)	0	0	-0.6	-1.6	-2.8	-10.7	-12.4	0	-1.6	0	0	0
Above Normal (15%)												
Existing Condition	373	741	621	316	760	436	469	4,462	2,488	1,048	450	450
No Project/No Action Alternative	373	713	621	316	831	436	469	4,462	2,488	1,048	450	450
Difference	0	-28	0	0	72	0	0	0	0	0	0	0
Percent Difference (%)	0	-3.7	0	0	9.4	0	0	0	0	0	0	0
Below Normal (17%)												
Existing Condition	373	300	300	300	517	319	507	3,774	1,672	869	450	450
No Project/No Action Alternative	373	300	300	300	517	319	507	3,774	1,672	869	450	450
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	0	0	0	0	0
Dry (22%)												
Existing Condition	373	300	300	300	300	300	529	3,216	1,251	667	450	450
No Project/No Action Alternative	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	0	0	0	0	0

Table 6-40
Trinity River Monthly Flow Downstream of Lewiston Lake (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critical (15%)												
Existing Condition	342	300	300	300	300	300	575	2,092	783	450	450	450
No Project/No Action Alternative	342	300	300	300	300	300	575	2,092	783	450	450	450
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

In general, flow changes would be minimal for both the long term and by water year type. Over the long term, the greatest change would be a reduction (6.7 percent) in March. By water year type, the greatest change would be a reduction (12.4 percent) in April of Wet water years. There would be no change in flows in Below Normal, Dry, and Critical water years because flow would be controlled by minimum flow requirements.

Klamath River Downstream of the Trinity River

Changes to Klamath River flows downstream of the Trinity River were not modeled. The Klamath River is relatively far downstream of the Trinity River, and flow changes were modeled on the Trinity River downstream of Lewiston Reservoir.

Changes to the Trinity River downstream of Lewiston Lake would be limited to slight reductions in spring flood spills. Flow changes and associated impacts would be even smaller downstream given the other flows coming together in the lower part of the watershed.

Clear Creek Tunnel

Table 6-41 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Clear Creek Tunnel flow. It presents data for averages over the long term and by water year types.

Table 6-41
Clear Creek Tunnel Monthly Flow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	981	382	243	468	92	268	403	155	518	1,782	1,866	1,660
No Project/No Action Alternative	1,033	344	257	420	95	269	389	168	551	1,812	1,926	1,666
Difference	52	-38	14	-48	2	2	-13	14	33	30	60	6
Percent Difference (%)	5.3	-10.0	5.7	-10.2	2.4	0.7	-3.3	8.8	6.4	1.7	3.2	0.4

Table 6-41
Clear Creek Tunnel Monthly Flow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Water Year Types[b]												
Wet (32%)												
Existing Condition	1,556	494	497	428	81	313	403	259	344	1,760	1,566	2,192
No Project/No Action Alternative	1,593	481	536	430	81	344	483	278	421	1,742	1,678	2,135
Difference	37	-14	39	2	0	30	80	19	77	-18	112	-57
Percent Difference (%)	2.4	-2.8	7.8	0.5	0	9.6	19.9	7.3	22.3	-1.0	7.1	-2.6
Above Normal (15%)												
Existing Condition	904	416	283	269	58	317	585	0	163	1,417	1,771	1,917
No Project/No Action Alternative	964	437	304	269	58	302	588	0	167	1,417	1,875	1,958
Difference	60	22	21	0	0	-16	2	0	3	0	104	42
Percent Difference (%)	6.7	5.2	7.6	0	0	-4.9	0.4	0	2.1	0	5.9	2.2
Below Normal (17%)												
Existing Condition	464	157	79	286	80	387	342	50	615	1,573	1,743	1,342
No Project/No Action Alternative	429	186	65	295	80	384	265	61	660	1,538	1,796	1,361
Difference	-36	29	-14	9	0	-3	-77	11	44	-36	53	18
Percent Difference (%)	-7.7	18.2	-17.6	3.1	0	-0.7	-22.5	2.2	7.2	-2.3	3.0	1.4
Dry (22%)												
Existing Condition	769	438	94	561	115	152	339	209	956	1,933	2,329	1,417
No Project/No Action Alternative	884	333	100	408	166	141	222	221	905	2,100	2,322	1,468
Difference	116	-105	7	-153	51	-11	-116	12	-51	167	-7	51
Percent Difference (%)	15.1	-24.0	7.1	-27.3	44.4	-7.5	-34.3	5.7	-5.3	8.7	-0.3	3.6
Critical (15%)												
Existing Condition	734	283	67	826	131	152	389	125	479	2,212	2,058	987
No Project/No Action Alternative	818	156	62	715	70	135	385	147	561	2,245	2,075	1,012
Difference	84	-127	-5	-111	-62	-17	-4	22	81	33	16	25
Percent Difference (%)	11.5	-45.0	-7.4	-13.4	-46.9	-10.9	-1.0	17.3	17.0	1.5	0.8	2.5

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over the long term, flows show that both increases and decreases would occur, with a maximum reduction (10.2 percent) occurring during January and a maximum increase (8.8 percent) occurring during May.

Whiskeytown Lake

For the purposes of evaluation, Whiskeytown Lake is assumed to continue to operate as it has historically (as a regulating reservoir). As a regulating reservoir, Whiskeytown Lake is operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs. Water levels in the reservoir vary over a day and over the span of a week. The regulating operations of Whiskeytown Lake would not be significantly changed by the Project. The modeling performed considered only flow variations on a monthly basis.

Clear Creek Downstream of Whiskeytown Lake

Table 6-42 shows the differences between the No Project/No Action Alternative and the Existing Conditions for monthly Clear Creek flow downstream of Whiskeytown Lake. It presents data for averages over the long term and by water year types.

Table 6-42
Clear Creek Monthly Flow Downstream of Whiskeytown Lake (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	182	183	184	193	194	188	188	262	180	85	86	146
No Project/No Action Alternative	185	187	189	197	197	192	191	265	181	85	86	148
Difference	2	5	5	3	3	5	3	3	2	0	0	2
Percent Difference (%)	1.3	2.5	3.0	1.8	1.8	2.6	1.5	1.1	0.9	0	0	0.8
Water Year Types[b]												
Wet (32%)												
Existing Condition	200	200	200	221	220	200	200	277	200	85	85	150
No Project/No Action Alternative	200	200	200	220	220	200	200	277	200	85	85	150
Difference	0	0	0	-1	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0.0	0	0	0	0	0	0	0	0
Above Normal (15%)												
Existing Condition	200	200	200	192	196	196	196	277	200	85	85	150
No Project/No Action Alternative	200	200	200	192	196	205	196	277	200	85	85	150
Difference	0	0	0	0	0	9	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	4.8	0	0	0	0	0	0
Below Normal (17%)												
Existing Condition	193	193	193	189	189	189	189	263	181	85	85	150
No Project/No Action Alternative	193	193	193	189	189	189	189	269	186	85	85	150
Difference	0	0	0	0	0	0	0	6	5	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	2.2	2.6	0	0	0
Dry (22%)												
Existing Condition	181	182	182	184	184	184	187	264	180	85	85	144
No Project/No Action Alternative	181	182	182	192	192	192	192	264	180	85	85	150
Difference	0	0	0	8	8	8	5	0	0	0	0	6
Percent Difference (%)	0	0	0	3.9	3.9	3.9	2.1	0	0	0	0	3.8
Critical (15%)												
Existing Condition	117	118	125	155	155	155	155	211	115	85	94	133
No Project/No Action Alternative	133	149	163	168	168	168	168	224	120	85	94	133
Difference	17	31	38	13	13	13	13	13	5	0	0	0
Percent Difference (%)	14.3	26.1	30.0	8.6	8.6	8.6	8.6	6.3	4.7	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes
cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

The long-term average shows that slight increases for most months would occur, with no reductions. Critical water years show that substantial increases would occur during October through December, with a maximum increase (three percent) occurring during December.

Spring Creek

For the purposes of this evaluation, the Spring Creek Detention Dam on Spring Creek was assumed to operate as it has historically as a debris dam. Flows between Whiskeytown, Shasta, and Keswick dams were not considered to be more adverse due to detention dam operations. Whiskeytown Lake and Keswick Reservoir are regulating reservoirs. These reservoirs are operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs. Water levels in these reservoirs vary over a day and over the span of a week. The regulating operations of Whiskeytown Lake and Keswick Reservoir would not be significantly changed by the Project. Therefore, Spring Creek Detention Dam flows would not be altered in response to the changes due to the Project. The modeling performed considered only flow variations on a monthly basis and did not include the Spring Creek Detention Dam.

Shasta Lake

Table 6-43 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Shasta Lake storage. It presents data for averages over the long term and by water year types.

Over the long term, there would be slight storage variations, with the largest change being a reduction (0.8 percent) in September. By water year type, the greatest increases (1.9 percent) would occur during September and October of Critical water years, and the largest reduction (1.6 percent) would occur during September of Above Normal water years. This type of change, where storage would generally decrease in wetter years and increase in drier years, is associated with greater deliveries in the No Project/No Action Alternative, when compared to Existing Conditions, and some reduced allocations in drier years.

Table 6-43
Shasta Lake End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	2,571	2,549	2,703	2,979	3,260	3,615	3,910	3,939	3,635	3,159	2,825	2,651
No Project/No Action Alternative	2,557	2,547	2,712	2,983	3,261	3,616	3,913	3,944	3,634	3,148	2,813	2,630
Difference	-14	-2	9	4	1	1	3	5	-2	-10	-12	-21
Percent Difference (%)	-0.5	-0.1	0.3	0.1	0.0	0.0	0.1	0.1	0.0	-0.3	-0.4	-0.8
Water Year Types[b]												
Wet (32%)												
Existing Condition	3,073	2,958	3,097	3,414	3,638	3,863	4,318	4,471	4,290	3,882	3,528	3,170
No Project/No Action Alternative	3,052	2,943	3,098	3,416	3,641	3,860	4,316	4,473	4,288	3,866	3,519	3,136
Difference	-20	-15	1	2	3	-3	-2	2	-2	-15	-9	-34
Percent Difference (%)	-0.7	-0.5	0.0	0.1	0.1	-0.1	-0.1	0.0	0.0	-0.4	-0.3	-1.1

Table 6-43
Shasta Lake End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Above Normal (15%)												
Existing Condition	2,996	2,914	3,081	3,145	3,425	3,962	4,402	4,478	4,128	3,563	3,229	3,085
No Project/No Action Alternative	2,952	2,886	3,058	3,124	3,406	3,955	4,400	4,477	4,118	3,544	3,200	3,036
Difference	-44	-29	-24	-22	-18	-7	-1	-1	-10	-19	-29	-49
Percent Difference (%)	-1.5	-1.0	-0.8	-0.7	-0.5	-0.2	0.0	0.0	-0.3	-0.5	-0.9	-1.6
Below Normal (17%)												
Existing Condition	2,859	2,929	2,998	2,928	3,305	3,693	4,061	4,090	3,756	3,263	2,938	2,882
No Project/No Action Alternative	2,846	2,924	3,010	2,945	3,303	3,697	4,069	4,096	3,762	3,253	2,918	2,861
Difference	-12	-5	12	17	-2	4	9	6	5	-10	-21	-21
Percent Difference (%)	-0.4	-0.2	0.4	0.6	0.0	0.1	0.2	0.2	0.1	-0.3	-0.7	-0.7
Dry (22%)												
Existing Condition	2,331	2,390	2,632	2,823	3,187	3,667	3,816	3,729	3,353	2,844	2,504	2,423
No Project/No Action Alternative	2,323	2,412	2,666	2,827	3,189	3,665	3,810	3,725	3,339	2,829	2,486	2,413
Difference	-9	22	34	5	2	-3	-6	-4	-13	-14	-19	-10
Percent Difference (%)	-0.4	0.9	1.3	0.2	0.1	-0.1	-0.2	-0.1	-0.4	-0.5	-0.7	-0.4
Critical (15%)												
Existing Condition	1,084	1,091	1,233	2,160	2,331	2,560	2,498	2,390	2,007	1,539	1,246	1,165
No Project/No Action Alternative	1,105	1,111	1,254	2,180	2,349	2,578	2,524	2,416	2,024	1,554	1,266	1,187
Difference	21	20	21	20	18	18	26	26	17	15	20	23
Percent Difference (%)	1.9	1.8	1.7	0.9	0.8	0.7	1.1	1.1	0.9	1.0	1.6	1.9

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

Percent Difference (%) = Relative Difference of the monthly average.
TAF = thousand acre-feet

Keswick Reservoir

For the purposes of evaluation, Keswick Reservoir is assumed to continue to operate as it has historically (as a regulating reservoir). As a regulating reservoir, Keswick Reservoir is operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs. Water levels in the reservoir vary over a day and over the span of a week. The regulating operations of Keswick Reservoir would not be significantly changed by the Project. The modeling performed considered only flow variations on a monthly basis.

Sacramento River

Table 6-44 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Sacramento River flow downstream of Keswick Reservoir. It presents data for averages over the long term and by water year types.

Table 6-44
Sacramento River Monthly Flow Downstream of Keswick Reservoir (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	6,248	6,621	6,866	8,252	10,154	8,553	6,998	7,881	10,711	13,036	10,467	7,909
No Project/No Action Alternative	6,191	6,373	6,696	8,274	10,211	8,555	6,942	7,866	10,846	13,210	10,550	8,069
Difference	-57	-247	-170	22	57	2	-57	-15	135	174	83	160
Percent Difference (%)	-0.9	-3.7	-2.5	0.3	0.6	0.0	-0.8	-0.2	1.3	1.3	0.8	2.0
Water Year Types[b]												
Wet (32%)												
Existing Condition	7,485	8,758	7,585	15,878	18,374	16,094	9,415	9,514	10,374	12,762	11,001	12,009
No Project/No Action Alternative	7,296	8,649	7,369	15,898	18,357	16,226	9,479	9,465	10,515	12,963	11,017	12,376
Difference	-190	-109	-216	20	-16	133	63	-50	141	201	15	367
Percent Difference (%)	-2.5	-1.2	-2.8	0.1	-0.1	0.8	0.7	-0.5	1.4	1.6	0.1	3.1
Above Normal (15%)												
Existing Condition	5,980	8,513	6,903	7,591	14,202	8,625	6,182	7,700	11,172	14,150	10,441	7,812
No Project/No Action Alternative	5,952	8,274	6,844	7,637	14,153	8,412	6,093	7,692	11,336	14,294	10,702	8,198
Difference	-28	-239	-59	46	-49	-213	-89	-8	164	144	260	386
Percent Difference (%)	-0.5	-2.8	-0.9	0.6	-0.3	-2.5	-1.4	-0.1	1.5	1.0	2.5	4.9
Below Normal (17%)												
Existing Condition	5,440	5,162	8,203	4,284	5,370	4,841	5,321	6,918	10,678	12,780	9,954	5,371
No Project/No Action Alternative	5,261	5,066	7,920	4,285	5,700	4,747	5,167	6,958	10,735	12,997	10,181	5,397
Difference	-178	-96	-284	2	330	-94	-154	40	57	217	226	26
Percent Difference (%)	-3.3	-1.9	-3.5	0.0	6.1	-1.9	-2.9	0.6	0.5	1.7	2.3	0.5
Dry (22%)												
Existing Condition	5,844	5,081	7,101	3,967	3,678	3,820	5,713	7,235	11,136	13,238	10,620	5,752
No Project/No Action Alternative	5,936	4,465	6,916	3,889	3,764	3,878	5,648	7,208	11,245	13,426	10,682	5,656
Difference	92	-617	-185	-78	86	58	-65	-28	109	188	62	-96
Percent Difference (%)	1.6	-12.1	-2.6	-2.0	2.3	1.5	-1.1	-0.4	1.0	1.4	0.6	-1.7
Critical (15%)												
Existing Condition	5,385	4,108	3,357	3,447	3,591	3,571	6,464	6,617	10,383	12,509	9,705	5,320
No Project/No Action Alternative	5,504	3,931	3,331	3,625	3,553	3,539	6,306	6,626	10,606	12,583	9,623	5,345
Difference	118	-176	-26	178	-38	-33	-158	9	223	74	-81	25
Percent Difference (%)	2.2	-4.3	-0.8	5.2	-1.1	-0.9	-2.5	0.1	2.2	0.6	-0.8	0.5

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over both the long term and by water year type, flows would decrease during October through December and increase during June through September, with relatively minor changes. The long-term average shows that a maximum reduction (3.7 percent) would occur during November and a maximum increase (two percent) would occur during September. By water year type, the largest flow reduction (12.1 percent) would occur in November of Dry water years, while flows show that a maximum increase (4.9 percent) would occur during September of Above Normal water years.

Table 6-45 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Sacramento River flow downstream of RBDD. It presents data for averages over the long term and by water year types.

Table 6-45
Sacramento River Monthly Flow Downstream of Red Bluff Diversion Dam (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	7,032	8,787	11,637	15,206	17,941	14,579	10,565	9,466	10,911	12,412	9,946	8,154
No Project/No Action Alternative	7,009	8,619	11,525	15,263	18,025	14,624	10,566	9,505	11,044	12,615	10,052	8,336
Difference	-24	-167	-112	57	83	45	1	38	132	203	106	182
Percent Difference (%)	-0.3	-1.9	-1.0	0.4	0.5	0.3	0.0	0.4	1.2	1.6	1.1	2.2
Water Year Types[b]												
Wet (32%)												
Existing Condition	8,281	11,194	12,240	27,681	30,270	25,051	15,105	11,949	10,894	12,072	10,333	12,262
No Project/No Action Alternative	8,110	11,165	12,073	27,709	30,272	25,221	15,212	11,926	10,975	12,224	10,305	12,617
Difference	-171	-29	-167	28	2	170	107	-23	82	152	-28	356
Percent Difference (%)	-2.1	-0.3	-1.4	0.1	0.0	0.7	0.7	-0.2	0.8	1.3	-0.3	2.9
Above Normal (15%)												
Existing Condition	6,884	10,747	11,818	16,243	23,485	16,211	10,353	9,416	11,011	13,079	9,679	8,013
No Project/No Action Alternative	6,889	10,585	11,813	16,316	23,461	16,046	10,312	9,441	11,141	13,240	9,956	8,419
Difference	5	-162	-4	73	-24	-165	-41	26	130	162	277	405
Percent Difference (%)	0.1	-1.5	0.0	0.5	-0.1	-1.0	-0.4	0.3	1.2	1.2	2.9	5.1
Below Normal (17%)												
Existing Condition	6,452	7,417	13,282	9,283	11,483	8,999	8,451	8,103	10,722	12,058	9,413	5,588
No Project/No Action Alternative	6,325	7,396	13,046	9,331	11,836	8,942	8,376	8,226	10,834	12,363	9,710	5,646
Difference	-126	-21	-236	47	352	-57	-75	123	112	305	297	58
Percent Difference (%)	-2.0	-0.3	-1.8	0.5	3.1	-0.6	-0.9	1.5	1.0	2.5	3.2	1.0
Dry (22%)												
Existing Condition	6,538	7,247	12,902	7,144	9,009	8,355	7,747	8,285	11,203	12,768	10,303	6,047
No Project/No Action Alternative	6,663	6,712	12,765	7,117	9,125	8,457	7,730	8,323	11,334	13,040	10,432	6,002
Difference	124	-535	-137	-27	115	102	-17	39	131	272	129	-45
Percent Difference (%)	1.9	-7.4	-1.1	-0.4	1.3	1.2	-0.2	0.5	1.2	2.1	1.2	-0.7
Critical (15%)												
Existing Condition	5,895	5,520	6,332	6,144	6,618	6,102	7,634	7,501	10,632	12,364	9,462	5,551
No Project/No Action Alternative	6,057	5,427	6,415	6,383	6,625	6,124	7,565	7,586	10,903	12,494	9,431	5,618
Difference	162	-92	83	239	7	21	-69	85	271	130	-31	67
Percent Difference (%)	2.8	-1.7	1.3	3.9	0.1	0.4	-0.9	1.1	2.5	1.1	-0.3	1.2

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

A comparison indicates slight changes in monthly flow overall. Flow changes over both the long term and by water year type would follow a pattern similar to those downstream of the Keswick Reservoir, although the changes would be relatively minor. Flows would decrease during October through December and increase during June through September. Over the long term, flows would show a maximum reduction (1.9 percent) during November and a maximum increase (2.2 percent) during September. By water year type, the largest flow decrease (7.4 percent) would occur in November of Dry water years, and flows show that a maximum increase (5.1 percent) would occur during September of Above Normal water years.

Table 6-46 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Sacramento River flow downstream of Hamilton City. It presents data for averages over the long term and by water year types.

Table 6-46
Sacramento River Monthly Flow Downstream of Hamilton City (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	6,619	9,075	12,936	17,250	20,300	16,660	10,162	8,718	8,620	9,888	8,073	7,785
No Project/No Action Alternative	6,532	8,851	12,793	17,292	20,370	16,703	10,163	8,656	8,665	9,944	8,041	7,880
Difference	-87	-224	-143	42	70	43	1	-62	46	56	-32	94
Percent Difference (%)	-1.3	-2.5	-1.1	0.2	0.3	0.3	0.0	-0.7	0.5	0.6	-0.4	1.2
Water Year Types[b]												
Wet (32%)												
Existing Condition	7,853	11,556	13,484	31,340	33,977	28,110	15,739	11,993	8,997	9,663	8,472	11,920
No Project/No Action Alternative	7,611	11,467	13,284	31,352	33,964	28,279	15,845	11,871	8,970	9,632	8,281	12,187
Difference	-242	-89	-200	13	-13	168	106	-121	-27	-31	-191	267
Percent Difference (%)	-3.1	-0.8	-1.5	0.0	0.0	0.6	0.7	-1.0	-0.3	-0.3	-2.3	2.2
Above Normal (15%)												
Existing Condition	6,474	11,083	13,152	18,882	26,624	18,886	10,245	8,864	8,710	10,487	7,736	7,644
No Project/No Action Alternative	6,419	10,862	13,115	18,941	26,586	18,718	10,201	8,790	8,755	10,463	7,853	7,957
Difference	-55	-220	-37	58	-37	-168	-43	-74	45	-24	118	314
Percent Difference (%)	-0.8	-2.0	-0.3	0.3	-0.1	-0.9	-0.4	-0.8	0.5	-0.2	1.5	4.1
Below Normal (17%)												
Existing Condition	6,147	7,766	14,677	10,647	13,229	10,421	7,874	7,027	8,254	9,373	7,410	5,181
No Project/No Action Alternative	5,948	7,687	14,413	10,679	13,568	10,361	7,793	7,038	8,268	9,528	7,580	5,154
Difference	-198	-79	-264	32	339	-59	-81	11	14	155	170	-28
Percent Difference (%)	-3.2	-1.0	-1.8	0.3	2.6	-0.6	-1.0	0.2	0.2	1.7	2.3	-0.5
Dry (22%)												
Existing Condition	6,042	7,550	14,569	7,957	10,413	9,935	6,626	6,905	8,520	10,084	8,346	5,656
No Project/No Action Alternative	6,095	6,958	14,399	7,915	10,515	10,034	6,604	6,833	8,582	10,236	8,344	5,525
Difference	53	-592	-170	-42	102	99	-22	-71	62	153	-3	-131
Percent Difference (%)	0.9	-7.8	-1.2	-0.5	1.0	1.0	-0.3	-1.0	0.7	1.5	0.0	-2.3
Critical (15%)												
Existing Condition	5,503	5,510	7,053	6,733	7,425	6,994	5,970	6,169	8,287	10,085	7,909	5,200
No Project/No Action Alternative	5,641	5,370	7,107	6,958	7,418	7,010	5,917	6,178	8,504	10,147	7,794	5,182
Difference	138	-141	55	225	-7	17	-53	9	217	62	-116	-18
Percent Difference (%)	2.5	-2.6	0.8	3.3	-0.1	0.2	-0.9	0.1	2.6	0.6	-1.5	-0.4

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

A comparison of the No Project/No Action Alternative and Existing Conditions indicates overall slight changes would occur in monthly flow downstream of Hamilton City. Over both the long term and by water year type, flow changes would follow a pattern similar to those upstream, and would be, therefore, relatively minor. Flows would decrease during October through December and increase during June through September. The long-term averages show that a maximum reduction of 2.5 percent would occur during November and a maximum increase of 1.2 percent would occur during September. By water year type, the largest flow reduction (7.8 percent) would occur during November of Dry water years, and flows would increase 4.1 percent during September of Above Normal water years.

Table 6-47 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Sacramento River flow downstream of the proposed Delevan Pipeline Intake. It presents data for averages over the long term and by water year types.

Table 6-47
Sacramento River Monthly Flow Downstream of the Proposed Delevan Pipeline Intake (cfs)
No Project / No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	6,306	9,052	14,656	21,192	25,420	19,912	11,635	8,443	7,819	8,727	7,319	7,972
No Project/No Action Alternative	6,234	8,862	14,547	21,245	25,498	19,959	11,661	8,385	7,862	8,770	7,277	8,066
Difference	-72	-190	-109	53	78	47	26	-58	43	43	-42	94
Percent Difference (%)	-1.1	-2.1	-0.7	0.3	0.3	0.2	0.2	-0.7	0.5	0.5	-0.6	1.2
Water Year Types[b]												
Wet (32%)												
Existing Condition	7,634	11,475	15,519	38,450	42,982	32,866	19,105	12,303	8,817	8,651	7,724	12,246
No Project/No Action Alternative	7,414	11,413	15,337	38,456	42,977	33,038	19,238	12,191	8,789	8,608	7,521	12,512
Difference	-220	-62	-182	7	-5	172	132	-111	-28	-42	-202	266
Percent Difference (%)	-2.9	-0.5	-1.2	0.0	0.0	0.5	0.7	-0.9	-0.3	-0.5	-2.6	2.2
Above Normal (15%)												
Existing Condition	6,246	11,166	14,847	24,460	32,370	24,091	11,987	8,976	7,824	9,124	7,024	7,851
No Project/No Action Alternative	6,212	11,019	14,836	24,491	32,399	23,921	11,972	8,904	7,864	9,087	7,132	8,159
Difference	-34	-147	-11	31	29	-170	-15	-72	40	-37	108	308
Percent Difference (%)	-0.5	-1.3	-0.1	0.1	0.1	-0.7	-0.1	-0.8	0.5	-0.4	1.5	3.9
Below Normal (17%)												
Existing Condition	5,946	8,101	16,785	12,874	16,828	12,226	8,830	6,775	7,233	8,097	6,559	5,317
No Project/No Action Alternative	5,761	8,082	16,579	12,964	17,158	12,172	8,782	6,787	7,244	8,240	6,717	5,287
Difference	-185	-19	-206	90	329	-54	-48	12	10	142	158	-30
Percent Difference (%)	-3.1	-0.2	-1.2	0.7	2.0	-0.4	-0.5	0.2	0.1	1.8	2.4	-0.6
Dry (22%)												
Existing Condition	5,556	7,438	16,198	9,455	13,318	12,085	6,699	5,929	7,278	8,920	7,469	5,731
No Project/No Action Alternative	5,620	6,869	16,082	9,443	13,412	12,190	6,698	5,860	7,336	9,060	7,454	5,603
Difference	64	-569	-116	-11	94	106	-1	-70	58	140	-14	-128
Percent Difference (%)	1.1	-7.6	-0.7	-0.1	0.7	0.9	0.0	-1.2	0.8	1.6	-0.2	-2.2
Critical (15%)												
Existing Condition	5,031	5,218	7,798	7,843	8,597	8,377	5,773	5,267	7,149	8,942	7,403	5,291
No Project/No Action Alternative	5,171	5,078	7,875	8,072	8,584	8,396	5,736	5,274	7,363	8,990	7,279	5,274
Difference	140	-140	78	228	-13	20	-37	7	214	49	-123	-17
Percent Difference (%)	2.8	-2.7	1.0	2.9	-0.2	0.2	-0.6	0.1	3.0	0.5	-1.7	-0.3

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

A comparison of the No Project/No Action Alternative and Existing Conditions indicates that overall slight changes in monthly flow would occur. Over both the long term and by water year type, flow changes would follow a pattern similar to those upstream. Flows would decrease during October through December, and would fluctuate between slight increases and decreases during the remainder of the year. The long-term averages show that a maximum reduction (2.1 percent) would occur during November and a maximum increase (1.2 percent) would occur during September. By water year type, the largest flow decrease (7.6 percent) would occur during November of Dry water years and the largest flow increase (3.9 percent) would occur during September of Above Normal water years.

GCID Canal Intake

Table 6-48 shows the differences between the No Project / No Action Alternative and Existing Conditions for monthly GCID Canal Intake flow at Hamilton City. It presents data for averages over the long term and by water year types.

Over both the long term and by water year type, the largest canal flows (by volume) would be made during April through August, which are relatively dry months when demands are high. Over the long term, flows would increase during November through February with a peak diversion increase (26.9 percent) in February. However, flows (by volume) are relatively small to begin with during these months.

Table 6-48
Glenn-Colusa Irrigation District Canal Intake Monthly Flow at Hamilton City (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	675	391	180	71	52	117	2,096	2,054	2,818	2,668	1,916	528
No Project/No Action Alternative	736	448	212	86	66	119	2,091	2,124	2,879	2,791	2,037	600
Difference	61	57	32	15	14	2	-5	70	61	123	121	72
Percent Difference (%)	9.0	14.5	17.5	21.1	26.9	1.7	-0.2	3.4	2.2	4.6	6.3	13.6
Water Year Types[b]												
Wet (32%)												
Existing Condition	706	404	197	67	52	105	1,931	2,085	2,864	2,728	1,977	561
No Project/No Action Alternative	775	464	230	83	65	107	1,933	2,155	2,945	2,865	2,105	632
Difference	69	59	33	16	13	2	2	70	81	136	128	71
Percent Difference (%)	9.7	14.7	16.9	23.9	25.0	1.9	0.1	3.4	2.8	5.0	6.5	12.7
Above Normal (15%)												
Existing Condition	703	398	175	61	49	100	2,063	2,047	2,900	2,738	1,988	548
No Project/No Action Alternative	761	456	209	76	63	103	2,063	2,118	2,958	2,880	2,119	623
Difference	58	58	33	15	13	3	0	71	58	142	131	74
Percent Difference (%)	8.3	14.6	18.9	24.6	26.5	3.0	0	3.5	2.0	5.2	6.6	13.6
Below Normal (17%)												
Existing Condition	692	406	170	77	52	125	2,200	2,139	2,862	2,746	2,011	547
No Project/No Action Alternative	761	464	198	92	66	126	2,199	2,218	2,932	2,877	2,129	616
Difference	70	58	28	15	14	2	-1	78	70	131	118	70
Percent Difference (%)	10.1	14.3	16.6	19.4	26.9	1.6	-0.1	3.7	2.4	4.8	5.9	12.7

Table 6-48
Glenn-Colusa Irrigation District Canal Intake Monthly Flow at Hamilton City (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Dry (22%)												
Existing Condition	696	376	191	74	54	122	2,213	2,111	2,889	2,715	1,944	526
No Project/No Action Alternative	764	433	223	89	67	124	2,212	2,187	2,934	2,834	2,075	598
Difference	68	57	33	15	13	2	-1	77	45	119	131	72
Percent Difference (%)	9.8	15.1	17.2	20.2	24.0	1.8	0.0	3.6	1.6	4.4	6.7	13.7
Critical (15%)												
Existing Condition	533	362	145	77	53	145	2,188	1,810	2,479	2,306	1,560	418
No Project/No Action Alternative	557	410	174	92	66	145	2,155	1,858	2,515	2,376	1,644	490
Difference	24	47	28	15	13	0	-33	48	35	70	84	72
Percent Difference (%)	4.5	13.1	19.4	19.4	24.5	0	-1.5	2.7	1.4	3.0	5.4	17.3

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Tehama-Colusa Canal

Table 6-49 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly T-C Canal Intake flow at the Red Bluff Diversion Dam. It presents data for averages over the long term and by water year types.

Table 6-49
Tehama-Colusa Canal Intake Monthly Flow at Red Bluff Diversion Dam (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	109	11	0	0	3	20	155	435	725	830	666	175
No Project/No Action Alternative	106	10	0	0	2	16	136	413	742	809	648	165
Difference	-3	-1	0	0	-1	-4	-19	-22	17	-21	-18	-10
Percent Difference (%)	-3.2	-9.1	0	0	-33.3	-20.0	-12.1	-5.1	2.4	-2.5	-2.7	-5.5
Water Year Types[b]												
Wet (32%)												
Existing Condition	142	13	0	0	0	16	152	605	1,008	1,159	906	239
No Project/No Action Alternative	141	11	0	0	0	13	149	603	1,074	1,206	943	249
Difference	-1	-1	0	0	0	-3	-3	-2	66	47	37	10
Percent Difference (%)	-0.8	-7.7	0	0	0	-18.8	-2.1	-0.4	6.6	4.0	4.1	4.2
Above Normal (15%)												
Existing Condition	110	8	0	0	0	13	188	594	1,011	1,139	882	233
No Project/No Action Alternative	110	8	0	0	0	12	175	583	1,044	1,118	862	219
Difference	0	0	0	0	0	-1	-13	-10	33	-21	-20	-14
Percent Difference (%)	0	0	0	0	0	-7.7	-6.9	-1.8	3.3	-1.8	-2.2	-5.9

Table 6-49
Tehama-Colusa Canal Intake Monthly Flow at Red Bluff Diversion Dam (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Below Normal (17%)												
Existing Condition	105	9	0	0	3	33	186	411	667	772	601	131
No Project/No Action Alternative	99	8	0	0	2	26	148	363	641	702	545	118
Difference	-6	-1	0	0	-1	-7	-38	-48	-27	-70	-56	-13
Percent Difference (%)	-5.6	-11.1			-33.3	-21.0	-20.4	-11.8	-4.0	-9.1	-9.3	-9.9
Dry (22%)												
Existing Condition	98	9	0	0	6	20	138	290	491	544	435	126
No Project/No Action Alternative	91	9	0	0	4	14	126	255	486	476	379	102
Difference	-7	0	0	0	-2	-5	-13	-34	-5	-68	-56	-23
Percent Difference (%)	-6.8	0	0	0	-33.3	-27.8	-9.1	-11.8	-1.0	-12.5	-12.9	-18.6
Critical (15%)												
Existing Condition	61	13	0	0	9	23	115	154	245	305	354	100
No Project/No Action Alternative	56	13	0	0	6	15	70	127	226	265	321	76
Difference	-4	0	0	0	-3	-8	-45	-27	-20	-40	-33	-24
Percent Difference (%)	-6.8	0	0	0	-33.3	-34.3	-39.0	-17.8	-8.1	-13.2	-9.3	-24.1

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Across both the long-term average and by water year type, T-C Canal Intake flows show relatively no change or small decreases, when compared to Existing Conditions, but with flows still peaking over the dry summer months of June and July.

Lake Oroville

Table 6-50 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Lake Oroville storage. It presents data for averages over the long term and by water year types.

Table 6-50
Lake Oroville End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	1,812	1,868	2,006	2,203	2,405	2,606	2,879	3,015	2,908	2,426	2,135	1,883
No Project/No Action Alternative	1,767	1,826	1,968	2,170	2,381	2,591	2,864	3,002	2,885	2,399	2,098	1,831
Difference	-45	-42	-37	-32	-24	-15	-15	-14	-23	-27	-36	-52
Percent Difference (%)	-2.5	-2.2	-1.9	-1.5	-1.0	-0.6	-0.5	-0.5	-0.8	-1.1	-1.7	-2.8

Table 6-50
Lake Oroville End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Water Year Types[b]												
Wet (32%)												
Existing Condition	2,464	2,503	2,544	2,697	2,868	2,945	3,303	3,507	3,488	3,146	2,987	2,563
No Project/No Action Alternative	2,377	2,423	2,485	2,679	2,860	2,945	3,304	3,508	3,483	3,125	2,927	2,473
Difference	-87	-80	-59	-18	-8	0	0	0	-5	-21	-60	-90
Percent Difference (%)	-3.5	-3.2	-2.3	-0.7	-0.3	0	0	0	-0.1	-0.7	-2.0	-3.5
Above Normal (15%)												
Existing Condition	2,012	2,071	2,178	2,321	2,624	2,938	3,300	3,498	3,398	2,842	2,478	2,090
No Project/No Action Alternative	1,965	2,024	2,128	2,296	2,610	2,930	3,292	3,498	3,393	2,821	2,434	2,039
Difference	-46	-47	-50	-25	-14	-9	-8	0	-6	-21	-44	-51
Percent Difference (%)	-2.3	-2.2	-2.3	-1.1	-0.5	-0.3	-0.3	0	-0.2	-0.7	-1.8	-2.4
Below Normal (17%)												
Existing Condition	1,906	1,972	2,184	2,108	2,352	2,608	2,984	3,206	3,109	2,526	2,129	1,965
No Project/No Action Alternative	1,867	1,939	2,150	2,078	2,334	2,593	2,969	3,191	3,082	2,490	2,081	1,911
Difference	-40	-33	-33	-30	-18	-15	-15	-15	-27	-35	-48	-54
Percent Difference (%)	-2.1	-1.7	-1.5	-1.4	-0.8	-0.6	-0.5	-0.5	-0.9	-1.4	-2.2	-2.7
Dry (22%)												
Existing Condition	1,236	1,328	1,590	1,904	2,122	2,415	2,608	2,654	2,452	1,879	1,426	1,303
No Project/No Action Alternative	1,242	1,331	1,579	1,842	2,069	2,386	2,578	2,621	2,403	1,827	1,422	1,297
Difference	5	3	-11	-62	-53	-29	-30	-33	-49	-51	-3	-7
Percent Difference (%)	0.4	0.2	-0.7	-3.2	-2.5	-1.2	-1.2	-1.2	-2.0	-2.7	-0.2	-0.5
Critical (15%)												
Existing Condition	954	975	1,081	1,571	1,669	1,824	1,820	1,788	1,608	1,153	1,015	975
No Project/No Action Alternative	921	947	1,060	1,542	1,636	1,792	1,790	1,760	1,573	1,154	1,000	941
Difference	-33	-29	-22	-29	-34	-31	-30	-28	-35	2	-15	-34
Percent Difference (%)	-3.5	-2.9	-2.0	-1.9	-2.0	-1.7	-1.6	-1.6	-2.2	0.1	-1.5	-3.5

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
Percent Difference (%) = Relative Difference of the monthly average.
TAF = thousand acre-feet

Storage would decrease for both the long term and all water year types. Over the long term, the maximum reduction (2.8 percent) would occur during September. By water year type, the maximum reduction (3.5 percent) would occur during September and October of both Wet and Critical water years.

Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay)

For the purposes of evaluation, the Thermalito Complex is assumed to continue to operate as it has historically (as a regulating reservoir complex). As a regulating reservoir, the Thermalito Complex is operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs and diversions into irrigation canals. Water levels in the reservoir vary over a day and over the span of a week. The regulating operations of the Thermalito Complex would not be significantly changed by the Project. The modeling performed considered only flow variations on a monthly basis.

Feather River

Table 6-51 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Feather River flow downstream of the Thermalito Complex. It presents data for averages over the long term and by water year types.

Table 6-51
Feather River Monthly Flow Downstream of the Thermalito Complex (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	2,935	2,282	3,523	4,739	5,651	6,079	3,076	3,645	3,625	7,632	4,837	4,626
No Project/No Action Alternative	2,815	2,230	3,453	4,661	5,498	5,941	3,079	3,640	3,783	7,723	4,992	4,831
Difference	-120	-52	-70	-78	-153	-137	3	-5	157	91	155	205
Percent Difference (%)	-4.1	-2.3	-2.0	-1.6	-2.7	-2.3	0.1	-0.1	4.3	1.2	3.2	4.4
Water Year Types[b]												
Wet (32%)												
Existing Condition	3,888	3,486	5,622	10,678	11,699	12,513	6,499	7,531	5,063	6,479	3,292	7,931
No Project/No Action Alternative	3,835	3,384	5,285	10,620	11,516	12,387	6,511	7,539	5,149	6,745	3,920	8,437
Difference	-54	-102	-338	-58	-183	-126	12	9	86	266	628	505
Percent Difference (%)	-1.4	-2.9	-6.0	-0.5	-1.6	-1.0	0.2	0.1	1.7	4.1	19.1	6.4
Above Normal (15%)												
Existing Condition	3,714	2,323	3,340	3,586	5,659	7,115	2,252	3,366	3,291	8,874	6,037	6,935
No Project/No Action Alternative	3,592	2,323	3,389	3,461	5,426	7,028	2,257	3,232	3,397	9,119	6,405	7,040
Difference	-122	0	49	-125	-233	-87	6	-133	106	245	368	105
Percent Difference (%)	-3.3		1.5	-3.5	-4.1	-1.2	0.3	-4.0	3.2	2.8	6.1	1.5
Below Normal (17%)												
Existing Condition	2,770	1,998	2,618	1,756	3,045	2,383	1,119	1,137	2,655	8,938	6,243	2,571
No Project/No Action Alternative	2,533	1,893	2,615	1,711	2,799	2,337	1,119	1,159	2,849	9,062	6,441	2,656
Difference	-236	-105	-3	-45	-245	-46	1	22	194	124	198	85
Percent Difference (%)	-8.5	-5.3	-0.1	-2.6	-8.1	-1.9	0.1	2.0	7.3	1.4	3.2	3.3
Dry (22%)												
Existing Condition	2,225	1,478	2,510	1,604	1,757	2,009	1,330	1,555	3,157	8,221	6,778	2,038
No Project/No Action Alternative	2,031	1,516	2,732	1,453	1,635	1,685	1,329	1,605	3,442	8,256	6,071	2,002
Difference	-193	38	222	-151	-122	-324	-1	50	285	35	-708	-36
Percent Difference (%)	-8.7	2.6	8.8	-9.4	-6.9	-16.1	-0.1	3.2	9.0	0.4	-10.4	-1.8
Critical (15%)												
Existing Condition	1,346	1,172	1,731	1,209	1,421	1,516	1,388	1,566	2,679	6,481	2,432	1,436
No Project/No Action Alternative	1,330	1,101	1,607	1,206	1,476	1,480	1,375	1,545	2,807	6,084	2,595	1,592
Difference	-17	-71	-124	-3	55	-37	-13	-21	129	-397	163	157
Percent Difference (%)	-1.2	-6.0	-7.2	-0.2	3.9	-2.4	-0.9	-1.3	4.8	-6.1	6.7	10.9

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Across both the long term and water year type averages, flows would decrease during October through March and increase during the remainder of the year. Over the long-term average, a maximum increase (4.4 percent) would occur during September and a maximum decrease (4.1 percent) would occur during October. By water year type, a maximum increase (19.1 percent) would occur during August of Wet water years and a maximum reduction (16.1 percent) would occur during March of Dry water years.

Sutter Bypass

Table 6-52 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Tisdale Weir flow into the Sutter Bypass. It presents data for averages over the long term and by water year types.

Table 6-52
Tisdale Weir Monthly Flow into the Sutter Bypass (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	9	151	1,017	2,245	3,232	2,127	899	89	47	0	0	0
No Project/No Action Alternative	8	147	1,010	2,248	3,231	2,125	897	89	45	0	0	0
Difference	-1	-4	-7	3	-1	-2	-2	0	-2	0	0	0
Percent Difference (%)	-11.1	-2.6	-0.7	0.1	0.0	-0.1	-0.2	0	-4.3	0	0	0
Water Year Types[b]												
Wet (32%)												
Existing Condition	0	96	1,088	5,283	7,222	4,819	2,391	170	147	0	0	0
No Project/No Action Alternative	0	98	1,109	5,277	7,193	4,834	2,396	169	143	0	0	0
Difference	0	2	21	-6	-29	15	5	-1	-4	0	0	0
Percent Difference (%)	0	2.1	1.9	-0.1	-0.4	0.3	0.2	-0.6	-2.7	0	0	0
Above Normal (15%)												
Existing Condition	0	513	1,109	2,723	3,702	3,230	791	241	0	0	0	0
No Project/No Action Alternative	0	511	1,096	2,726	3,647	3,200	767	241	0	0	0	0
Difference	0	-2	-13	3	-55	-30	-24	0	0	0	0	0
Percent Difference (%)	0	-0.4	-1.2	0.1	-1.5	-0.9	-3.0	0	0	0	0	0
Below Normal (17%)												
Existing Condition	53	101	1,292	611	1,206	270	145	0	0	0	0	0
No Project/No Action Alternative	49	101	1,231	613	1,293	265	147	0	0	0	0	0
Difference	-4	0	-61	2	87	-5	2	0	0	0	0	0
Percent Difference (%)	-7.5	0	-4.7	0.3	7.2	-1.9	1.4	0	0	0	0	0
Dry (22%)												
Existing Condition	0	128	1,263	263	818	365	0	0	0	0	0	0
No Project/No Action Alternative	0	110	1,255	278	823	356	0	0	0	0	0	0
Difference	0	-18	-8	15	5	-9	0	0	0	0	0	0
Percent Difference (%)	0	-14.1	-0.6	5.7	0.6	-2.5	0	0	0	0	0	0
Critical (15%)												
Existing Condition	0	0	84	65	101	3	0	0	0	0	0	0
No Project/No Action Alternative	0	0	86	67	101	3	0	0	0	0	0	0
Difference	0	0	2	2	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	2.4	3.1	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over the long-term average, flows show that either no change or slight decreases would occur, with a maximum reduction (11.1 percent) occurring during October.

Table 6-53 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Colusa Weir flow into the Sutter Bypass. It presents data for averages over the long term and by water year types. Over the long-term average, flows show either no change or slight decreases, with a maximum decrease (-12.5 percent) in October.

Table 6-53
Colusa Weir Monthly Flow into the Sutter Bypass (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	8	133	1,336	3,912	5,705	3,538	1,179	68	20	0	0	0
No Project/No Action Alternative	7	126	1,329	3,917	5,723	3,523	1,174	68	19	0	0	0
Difference	-1	-7	-7	5	18	-15	-5	0	-1	0	0	0
Percent Difference (%)	-12.5	-5.3	-0.5	0.1	0.3	-0.4	-0.4	0	-5.0	0	0	0
Water Year Types[b]												
Wet (32%)												
Existing Condition	0	35	1,281	9,969	14,078	8,592	3,191	128	63	0	0	0
No Project/No Action Alternative	0	35	1,292	9,956	14,022	8,607	3,195	128	61	0	0	0
Difference	0	0	11	-13	-56	15	4	0	-2	0	0	0
Percent Difference (%)	0	0	0.9	-0.1	-0.4	0.2	0.1	0	-3.2	0	0	0
Above Normal (15%)												
Existing Condition	0	613	1,258	3,949	5,885	5,033	1,043	186	0	0	0	0
No Project/No Action Alternative	0	589	1,240	3,961	5,888	4,959	997	187	0	0	0	0
Difference	0	-24	-18	12	3	-74	-46	1	0	0	0	0
Percent Difference (%)	0	-3.9	-1.4	0.3	0.1	-1.5	-4.4	0.5	0	0	0	0
Below Normal (17%)												
Existing Condition	46	70	1,688	716	1,245	104	88	0	0	0	0	0
No Project/No Action Alternative	40	75	1,613	716	1,433	83	89	0	0	0	0	0
Difference	-6	5	-75	0	188	-21	1	0	0	0	0	0
Percent Difference (%)	-13.0	7.1	-4.4	0	15.1	-20.2	1.1	0	0	0	0	0
Dry (22%)												
Existing Condition	0	94	2,064	225	755	271	0	0	0	0	0	0
No Project/No Action Alternative	0	75	2,090	256	768	245	0	0	0	0	0	0
Difference	0	-19	26	31	13	-26	0	0	0	0	0	0
Percent Difference (%)	0	-20.2	1.3	13.8	1.7	-9.6	0	0	0	0	0	0
Critical (15%)												
Existing Condition	0	0	28	13	13	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	29	14	13	0	0	0	0	0	0	0
Difference	0	0	1	1	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	3.6	7.7	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Table 6-54 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Moulton Weir flow into the Sutter Bypass. It presents data for averages over the long term and by water year types. Over the long term, flows show either no change or minor changes.

Table 6-54
Moulton Weir Monthly Flow into the Sutter Bypass (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	0	0	57	289	464	242	32	0	0	0	0	0
No Project/No Action Alternative	0	0	59	283	467	240	32	0	0	0	0	0
Difference	0	0	1	-5	3	-2	0	0	0	0	0	0
Percent Difference (%)	0	0	2.6	-1.8	0.6	-0.6	0	0	0	0	0	0
Water Year Types[b]												
Wet (32%)												
Existing Condition	0	0	46	847	1,360	694	82	0	0	0	0	0
No Project/No Action Alternative	0	0	42	829	1,367	690	83	0	0	0	0	0
Difference	0	0	-5	-18	7	-4	1	0	0	0	0	0
Percent Difference (%)	0	0	-9.8	-2.1	0.5	-0.6	0.6	0	0	0	0	0
Above Normal (15%)												
Existing Condition	0	0	7	136	226	148	38	0	0	0	0	0
No Project/No Action Alternative	0	0	7	139	229	147	38	0	0	0	0	0
Difference	0	0	0	3	2	-1	1	0	0	0	0	0
Percent Difference (%)	0	0	0	2.3	1.1	-0.5	1.5	0	0	0	0	0
Below Normal (17%)												
Existing Condition	0	0	98	1	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	94	1	0	0	0	0	0	0	0	0
Difference	0	0	-4	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	-4.3	0	0	0	0	0	0	0	0	0
Dry (22%)												
Existing Condition	0	0	113	0	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	130	0	0	0	0	0	0	0	0	0
Difference	0	0	17	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	14.7	0	0	0	0	0	0	0	0	0
Critical (15%)												
Existing Condition	0	0	0	0	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	0	0	0	0	0	0	0	0	0	0
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Table 6-55 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Ord Ferry flow into the Sutter Bypass. It presents data for averages over the long term and by water year types. Over the long term, flows show either no change or minor changes.

Table 6-55
Ord Ferry Monthly Flow into the Sutter Bypass (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	0	0	60	262	427	189	13	0	0	0	0	0
No Project/No Action Alternative	0	0	63	257	431	189	14	0	0	0	0	0
Difference	0	0	3	-5	4	0	1	0	0	0	0	0
Percent Difference (%)	0	0	4.4	-1.8	0.9	0	0.9	0	0	0	0	0
Water Year Types[b]												
Wet (32%)												
Existing Condition	0	0	37	795	1,204	555	34	0	0	0	0	0
No Project/No Action Alternative	0	0	29	779	1,213	554	34	0	0	0	0	0
Difference	0	0	-7	-17	9	0	0	0	0	0	0	0
Percent Difference (%)	0	0	-19.7	-2.1	0.8	0	0	0	0	0	0	0
Above Normal (15%)												
Existing Condition	0	0	1	64	310	88	18	0	0	0	0	0
No Project/No Action Alternative	0	0	1	68	316	88	19	0	0	0	0	0
Difference	0	0	0	5	6	1	1	0	0	0	0	0
Percent Difference (%)	0	0	0	7.4	1.9	0.7	5.5	0	0	0	0	0
Below Normal (17%)												
Existing Condition	0	0	128	0	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	123	0	0	0	0	0	0	0	0	0
Difference	0	0	-5	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	-3.8	0	0	0	0	0	0	0	0	0
Dry (22%)												
Existing Condition	0	0	121	0	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	147	0	0	0	0	0	0	0	0	0
Difference	0	0	26	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	21.8	0	0	0	0	0	0	0	0	0
Critical (15%)												
Existing Condition	0	0	0	0	0	0	0	0	0	0	0	0
No Project/No Action Alternative	0	0	0	0	0	0	0	0	0	0	0	0
Difference	0	0	0	0	0	0	0	0	0	0	0	0
Percent Difference (%)	0	0	0	0	0	0	0	0	0	0	0	0

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Yolo Bypass

Table 6-56 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Yolo Bypass flow. It presents data for averages over the long term and by water year types.

Table 6-56
Yolo Bypass Monthly Flow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	145	404	3,317	9,687	12,548	8,298	2,428	267	120	47	102	82
No Project/No Action Alternative	100	413	3,334	9,711	12,487	8,325	2,476	265	126	48	100	83
Difference	-45	9	17	24	-61	27	48	-2	6	1	-2	1
Percent Difference (%)	-31.0	2.2	0.5	0.2	-0.5	0.3	2.0	-0.7	5.0	2.1	-2.0	1.2
Water Year Types[b]												
Wet (32%)												
Existing Condition	84	591	4,322	26,071	31,139	21,303	6,490	640	240	47	149	95
No Project/No Action Alternative	86	622	4,191	26,131	31,005	21,378	6,583	631	256	48	143	102
Difference	2	31	-131	60	-134	75	93	-9	16	1	-6	7
Percent Difference (%)	2.4	5.2	-3.0	0.2	-0.4	0.4	1.4	-1.4	6.7	2.1	-4.0	7.4
Above Normal (15%)												
Existing Condition	34	850	1,408	7,455	12,263	8,396	1,399	183	65	47	96	67
No Project/No Action Alternative	37	859	1,440	7,385	11,958	8,418	1,424	183	66	48	95	65
Difference	3	9	32	-70	-305	22	25	0	1	1	-1	-2
Percent Difference (%)	8.8	1.1	2.3	-0.9	-2.5	0.3	1.8	0	1.5	2.1	-1.0	-3.0
Below Normal (17%)												
Existing Condition	563	228	3,233	1,002	2,662	715	488	64	64	47	116	88
No Project/No Action Alternative	286	278	3,321	1,047	2,780	693	568	67	66	48	114	86
Difference	-277	50	88	45	118	-22	80	3	2	1	-2	-2
Percent Difference (%)	-49.2	21.9	2.7	4.5	4.4	-3.1	16.4	4.7	3.1	2.1	-1.7	-2.3
Dry (22%)												
Existing Condition	45	231	5,233	515	1,703	691	306	76	65	47	60	72
No Project/No Action Alternative	46	180	5,387	542	1,722	701	308	77	67	48	61	73
Difference	1	-51	154	27	19	10	2	1	2	1	1	1
Percent Difference (%)	2.2	-22.1	2.9	5.2	1.1	1.4	0.7	1.3	3.1	2.1	1.7	1.4
Critical (15%)												
Existing Condition	53	19	274	309	358	279	104	65	63	47	54	75
No Project/No Action Alternative	56	22	303	318	363	292	107	68	64	48	54	70
Difference	3	3	29	9	5	13	3	3	1	1	0	-5
Percent Difference (%)	5.7	15.8	10.6	2.9	1.4	4.7	2.9	4.6	1.6	2.1	0	-6.7

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over the long term and by water year type, flows show that increases and decreases would occur with variation occurring between months. The flows over the Sacramento and Freemont weirs would occur during high flow, flood conditions in the Sacramento River and could vary widely from day to day and through a month. The flows shown in Table 6-56 are averages for each month and water year type. For a change shown in the table, the increases and decreases in flows could have either occurred in many months or in few months depending on how high flow, flood conditions changed with the No Project/No Action Alternative. Appendix 6B and Appendix 6C include detailed modeling results for all of the weirs along the Sacramento River. These variations in flow conditions are evaluated in more detail in Chapter 12 Aquatic Biological Resources.

Folsom Lake

Table 6-57 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Folsom Lake storage. It presents data for averages over the long-term and by water year types.

Over both the long-term and by water year type, storage would decrease with a maximum long-term average reduction (2.9 percent) in August. The reductions between the No Project/No Action Alternative and Existing Conditions are due to the inclusion of new and increased diversions represented in the No Project/No Action Alternative modeling assumptions. More specifically, an increase in urban M&I use within the American River Basin is not included in Existing Conditions, but is included in the No Project/No Action Alternative and Alternatives A, B, and C.

Table 6-57
Folsom Lake End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	489	445	456	471	488	592	721	844	817	682	599	509
No Project/No Action Alternative	477	435	448	466	487	594	719	840	810	666	582	496
Difference	-12	-10	-8	-5	-1	2	-3	-4	-7	-16	-18	-13
Percent Difference (%)	-2.6	-2.2	-1.8	-1.0	-0.1	0.4	-0.4	-0.4	-0.9	-2.3	-2.9	-2.6
Water Year Types[b]												
Wet (32%)												
Existing Condition	599	510	509	520	502	633	794	966	966	877	770	606
No Project/No Action Alternative	590	505	505	520	505	634	792	964	961	867	762	600
Difference	-8	-5	-3	0	3	1	-2	-3	-5	-9	-8	-6
Percent Difference (%)	-1.4	-1.0	-0.7	0	0.7	0.2	-0.2	-0.3	-0.5	-1.1	-1.1	-1.0
Above Normal (15%)												
Existing Condition	544	487	505	518	529	642	796	968	947	757	688	573
No Project/No Action Alternative	528	474	492	516	533	649	796	966	939	744	662	559
Difference	-17	-13	-13	-2	4	7	0	-2	-8	-13	-26	-14
Percent Difference (%)	-3.1	-2.7	-2.5	-0.4	0.8	1.1	0	-0.2	-0.8	-1.7	-3.8	-2.5
Below Normal (17%)												
Existing Condition	577	529	516	508	540	637	788	932	912	719	650	594
No Project/No Action Alternative	558	508	504	500	538	635	787	928	907	685	610	565
Difference	-19	-21	-12	-9	-2	-3	-1	-4	-5	-34	-40	-29
Percent Difference (%)	-3.3	-3.9	-2.3	-1.7	-0.4	-0.4	-0.1	-0.4	-0.5	-4.7	-6.2	-5.0

Table 6-57
Folsom Lake End-of-Month Storage (TAF)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Dry (22%)												
Existing Condition	401	402	417	436	497	592	708	782	720	559	467	431
No Project/No Action Alternative	390	396	410	430	495	601	704	777	708	541	451	420
Difference	-11	-7	-7	-6	-2	10	-4	-5	-12	-18	-15	-10
Percent Difference (%)	-2.7	-1.6	-1.7	-1.5	-0.3	1.7	-0.6	-0.6	-1.7	-3.3	-3.2	-2.4
Critical (15%)												
Existing Condition	227	225	281	326	345	401	433	443	400	329	280	251
No Project/No Action Alternative	215	215	269	316	334	396	425	437	391	321	274	239
Difference	-12	-10	-12	-10	-11	-5	-8	-6	-9	-9	-6	-12
Percent Difference (%)	-5.5	-4.5	-4.4	-3.1	-3.2	-1.1	-1.8	-1.3	-2.2	-2.7	-2.1	-4.7

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:
Percent Difference (%) = Relative Difference of the monthly average.
TAF = thousand acre-feet

Lake Natoma

For the purposes of evaluation, Lake Natoma is assumed to continue to operate as it has historically (as a regulating reservoir). As a regulating reservoir, Lake Natoma is operated to manage inflows that vary hourly for power generation needs and manage releases that vary daily for meeting downstream flow needs and diversions into the Folsom South Canal. Water levels in the reservoir vary over a day and over the span of a week. The regulating operations of Lake Natoma would not be significantly changed by the Project. The modeling performed considered only flow variations on a monthly basis.

American River

Table 6-58 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly American River flow downstream of Lake Natoma. It presents data for averages over the long term and by water year types.

Expected flow changes correspond with the trends seen in Folsom Lake storage upstream, with flows decreasing during nearly all months over both the long-term and by water year types. The expected reductions between the No Project/No Action Alternative and Existing Conditions are due to the inclusion of new diversions represented in the No Project/No Action Alternative modeling assumptions, as discussed for Folsom Lake, which draw off of both the American River and Sacramento River.

The long-term average shows a maximum reduction (8.4 percent) occurring during September. Comparing by water year types, flows would decrease more as years become drier. Maximum reductions would occur during August and September for all water year types, with a maximum reduction (18.3 percent) occurring in September of Critical water years.

Table 6-58
American River Monthly Flow Downstream of Lake Natoma (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	1,601	2,831	3,341	4,446	5,173	3,773	3,290	3,603	3,702	3,763	2,704	2,923
No Project/No Action Alternative	1,498	2,745	3,268	4,368	5,068	3,686	3,255	3,461	3,526	3,640	2,501	2,679
Difference	-103	-86	-73	-78	-105	-87	-36	-142	-176	-123	-203	-245
Percent Difference (%)	-6.4	-3.0	-2.2	-1.8	-2.0	-2.3	-1.1	-3.9	-4.8	-3.3	-7.5	-8.4
Water Year Types[b]												
Wet (32%)												
Existing Condition	1,689	4,010	3,687	8,765	9,244	6,089	5,300	6,157	6,003	4,102	3,530	4,518
No Project/No Action Alternative	1,634	3,901	3,618	8,626	9,123	6,055	5,197	5,968	5,780	3,898	3,267	4,293
Difference	-55	-109	-69	-139	-121	-34	-103	-189	-223	-203	-263	-225
Percent Difference (%)	-3.3	-2.7	-1.9	-1.6	-1.3	-0.6	-1.9	-3.1	-3.7	-5.0	-7.4	-5.0
Above Normal (15%)												
Existing Condition	1,581	2,854	2,950	4,718	6,355	5,426	3,547	3,885	3,431	4,606	2,645	3,448
No Project/No Action Alternative	1,525	2,743	2,900	4,521	6,203	5,332	3,454	3,649	3,255	4,415	2,632	3,088
Difference	-56	-111	-51	-197	-151	-94	-92	-236	-176	-191	-13	-361
Percent Difference (%)	-3.6	-3.9	-1.7	-4.2	-2.4	-1.7	-2.6	-6.1	-5.1	-4.2	-0.5	-10.5
Below Normal (17%)												
Existing Condition	1,907	3,365	4,164	2,313	4,291	2,423	3,113	2,936	2,861	4,588	2,521	2,403
No Project/No Action Alternative	1,649	3,356	3,983	2,273	4,139	2,387	2,972	2,799	2,637	4,835	2,397	2,060
Difference	-258	-9	-181	-40	-152	-36	-141	-137	-224	246	-124	-344
Percent Difference (%)	-13.5	-0.3	-4.3	-1.7	-3.6	-1.5	-4.5	-4.7	-7.8	5.4	-4.9	-14.3
Dry (22%)												
Existing Condition	1,531	1,867	4,056	1,686	1,879	2,210	1,774	1,807	2,460	3,454	2,581	1,869
No Project/No Action Alternative	1,439	1,771	4,027	1,709	1,773	2,010	1,907	1,715	2,372	3,254	2,308	1,593
Difference	-92	-96	-29	22	-106	-200	133	-92	-88	-200	-273	-276
Percent Difference (%)	-6.0	-5.2	-0.7	1.3	-5.7	-9.1	7.5	-5.1	-3.6	-5.8	-10.6	-14.8
Critical (15%)												
Existing Condition	1,177	1,077	946	1,445	1,140	1,021	1,160	1,263	1,830	1,686	1,368	1,130
No Project/No Action Alternative	1,089	990	906	1,423	1,175	939	1,197	1,234	1,679	1,493	1,118	1,123
Difference	-88	-87	-40	-23	35	-82	37	-28	-151	-193	-250	-8
Percent Difference (%)	-7.5	-8.1	-4.3	-1.6	3.1	-8.0	3.2	-2.3	-8.3	-11.4	-18.3	-0.7

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Sacramento-San Joaquin Delta

Table 6-59 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Sacramento-San Joaquin Delta outflow. It presents data for averages over the long term and by water year types.

Table 6-59
Sacramento-San Joaquin Delta Monthly Outflow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	6,015	11,701	21,478	42,346	51,555	42,576	30,053	22,456	12,771	7,964	4,594	9,715
No Project/No Action Alternative	5,927	11,674	21,446	42,528	51,653	42,537	29,887	22,080	12,750	8,048	4,593	9,663
Difference	-88	-27	-32	182	97	-39	-165	-375	-21	84	-1	-51
Percent Difference (%)	-1.5	-0.2	-0.1	0.4	0.2	-0.1	-0.5	-1.7	-0.2	1.1	0.0	-0.5
Water Year Types[b]												
Wet (32%)												
Existing Condition	8,619	18,566	25,599	84,561	95,616	78,190	54,405	41,030	23,448	11,450	5,315	19,675
No Project/No Action Alternative	8,387	18,519	25,088	84,405	95,517	78,395	54,269	40,411	23,163	11,329	5,031	19,685
Difference	-232	-47	-511	-157	-100	205	-136	-619	-285	-122	-284	10
Percent Difference (%)	-2.7	-0.3	-2.0	-0.2	-0.1	0.3	-0.2	-1.5	-1.2	-1.1	-5.3	0.0
Above Normal (15%)												
Existing Condition	5,987	13,440	19,292	47,769	60,267	53,235	31,967	24,235	11,822	9,555	4,000	11,797
No Project/No Action Alternative	5,945	13,441	19,382	47,552	60,411	52,963	31,605	23,647	11,872	9,611	4,000	11,732
Difference	-41	1	90	-217	144	-272	-362	-589	50	56	0	-65
Percent Difference (%)	-0.7	0.0	0.5	-0.5	0.2	-0.5	-1.1	-2.4	0.4	0.6	0	-0.6
Below Normal (17%)												
Existing Condition	5,993	9,661	26,644	21,818	35,261	22,901	21,757	16,044	8,050	7,081	4,000	3,456
No Project/No Action Alternative	5,694	9,690	26,481	22,181	35,426	22,962	21,469	15,813	8,200	7,446	4,011	3,330
Difference	-299	29	-164	363	166	61	-288	-231	150	365	11	-126
Percent Difference (%)	-5.0	0.3	-0.6	1.7	0.5	0.3	-1.3	-1.4	1.9	5.2	0.3	-3.6
Dry (22%)												
Existing Condition	4,088	6,895	22,691	14,543	20,879	19,756	14,036	10,412	6,622	5,040	4,744	3,284
No Project/No Action Alternative	4,164	6,822	23,161	14,784	20,810	19,584	14,060	10,203	6,788	5,221	4,879	3,172
Difference	76	-73	470	241	-69	-172	24	-209	166	182	135	-112
Percent Difference (%)	1.9	-1.1	2.1	1.7	-0.3	-0.9	0.2	-2.0	2.5	3.6	2.9	-3.4
Critical (15%)												
Existing Condition	3,318	4,677	6,886	11,113	12,402	11,937	9,076	5,978	5,316	4,233	4,093	3,000
No Project/No Action Alternative	3,497	4,672	7,170	12,128	13,050	11,686	8,904	5,927	5,318	4,316	4,489	3,008
Difference	179	-4	284	1,015	647	-251	-172	-51	3	83	395	8
Percent Difference (%)	5.4	-0.1	4.1	9.1	5.2	-2.1	-1.9	-0.8	0.1	2.0	9.7	0.3

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over the long-term average, outflow shows that little change would occur, with a maximum increase (1.1 percent) occurring in July and a maximum reduction (1.7 percent) occurring in May. During Wet and Above Normal water years, outflows would decrease during most months.

Table 6-60 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Delta Cross Channel flow. It presents data for averages over the long term and by water year types.

Table 6-60
Delta Cross Channel Monthly Flow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	4,723	4,031	4,492	4,999	5,691	5,148	3,904	3,371	5,669	7,701	6,529	5,727
No Project/No Action Alternative	4,708	4,028	4,507	5,014	5,702	5,143	3,909	3,347	5,679	7,772	6,490	5,711
Difference	-14	-3	15	15	11	-4	5	-24	9	72	-39	-17
Percent Difference (%)	-0.3	-0.1	0.3	0.3	0.2	-0.1	0.1	-0.7	0.2	0.9	-0.6	-0.3
Water Year Types[b]												
Wet (32%)												
Existing Condition	4,670	4,184	4,913	7,566	8,385	7,381	5,860	5,077	6,583	7,701	6,718	5,350
No Project/No Action Alternative	4,734	4,204	4,923	7,555	8,380	7,401	5,875	5,047	6,554	7,922	6,759	5,434
Difference	64	20	9	-11	-5	21	15	-31	-29	222	42	84
Percent Difference (%)	1.4	0.5	0.2	-0.1	-0.1	0.3	0.3	-0.6	-0.4	2.9	0.6	1.6
Above Normal (15%)												
Existing Condition	5,116	4,335	4,509	5,922	6,760	6,681	4,282	3,629	5,492	8,474	6,770	8,100
No Project/No Action Alternative	5,081	4,373	4,548	5,929	6,776	6,663	4,281	3,580	5,499	8,492	6,908	8,115
Difference	-35	37	40	7	16	-18	-1	-49	6	17	138	14
Percent Difference (%)	-0.7	0.9	0.9	0.1	0.2	-0.3	0.0	-1.3	0.1	0.2	2.0	0.2
Below Normal (17%)												
Existing Condition	5,104	4,279	5,043	3,841	4,923	3,910	3,165	2,687	5,594	8,141	6,632	5,743
No Project/No Action Alternative	4,988	4,301	5,024	3,875	4,930	3,917	3,142	2,674	5,592	8,311	6,690	5,654
Difference	-116	23	-19	34	7	7	-23	-13	-2	170	58	-89
Percent Difference (%)	-2.3	0.5	-0.4	0.9	0.1	0.2	-0.7	-0.5	0.0	2.1	0.9	-1.5
Dry (22%)												
Existing Condition	4,612	3,798	4,324	3,119	3,645	3,578	2,545	2,276	5,233	7,689	6,993	5,497
No Project/No Action Alternative	4,541	3,747	4,345	3,130	3,655	3,540	2,570	2,259	5,293	7,668	6,693	5,361
Difference	-70	-51	21	11	10	-38	25	-17	60	-21	-301	-136
Percent Difference (%)	-1.5	-1.3	0.5	0.3	0.3	-1.1	1.0	-0.7	1.1	-0.3	-4.3	-2.5
Critical (15%)												
Existing Condition	4,164	3,455	3,175	2,686	2,752	2,575	2,190	1,859	4,610	6,429	5,061	4,500
No Project/No Action Alternative	4,205	3,402	3,206	2,746	2,797	2,566	2,183	1,850	4,641	6,257	4,952	4,497
Difference	41	-53	32	60	45	-9	-7	-8	31	-173	-109	-3
Percent Difference (%)	1.0	-1.5	1.0	2.2	1.6	-0.3	-0.3	-0.5	0.7	-2.7	-2.2	-0.1

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Over both the long-term and by water year types, flows show that little change would occur, with a maximum increase (0.9 percent) occurring during July and a maximum decrease (0.7 percent) occurring during May.

Table 6-61 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Old and Middle river flows. It presents data for averages over the long term and by water year types. A negative flow value indicates reverse flow conditions.

Table 6-61
Old and Middle Rivers Monthly Flow (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	-6,178	-6,084	-6,640	-3,473	-3,279	-2,779	840	352	-3,773	-9,589	-9,250	-7,582
No Project/No Action Alternative	-6,024	-6,006	-6,736	-3,456	-3,185	-2,843	752	265	-3,714	-9,532	-9,171	-7,712
Difference	154	78	-96	17	94	-64	-87	-88	59	57	79	-130
Percent Difference (%)	-2.5	-1.3	1.4	-0.5	-2.9	2.3	-10.4	-24.9	-1.6	-0.6	-0.9	1.7
Water Year Types[b]												
Wet (32%)												
Existing Condition	-6,294	-5,523	-6,886	-1,965	-2,581	-1,851	2,431	1,648	-4,166	-8,954	-10,070	-8,041
No Project/No Action Alternative	-6,186	-5,518	-7,037	-2,094	-2,518	-1,900	2,264	1,385	-4,208	-8,917	-10,406	-8,540
Difference	108	5	-150	-129	63	-48	-167	-263	-41	37	-337	-499
Percent Difference (%)	-1.7	-.09	2.2	6.6	-2.4	2.6	-6.9	-16.0	1.0	-0.4	3.3	6.2
Above Normal (15%)												
Existing Condition	-6,718	-6,149	-7,623	-3,547	-3,286	-4,070	1,058	500	-4,840	-10,022	-10,452	-8,345
No Project/No Action Alternative	-6,596	-6,082	-7,821	-3,723	-2,947	-4,269	910	415	-4,707	-9,954	-10,873	-8,531
Difference	122	67	-198	-177	339	-199	-148	-84	133	68	-421	-186
Percent Difference (%)	-1.8	-1.1	2.6	4.9	-10.3	-4.9	-14.0	-16.8	-2.7	-.70	4.0	2.2
Below Normal (17%)												
Existing Condition	-7,414	-8,152	-6,550	-4,240	-3,434	-3,968	688	273	-4,056	-10,659	-9,892	-8,598
No Project/No Action Alternative	-7,108	-8,187	-6,606	-4,240	-3,389	-3,923	637	248	-3,812	-10,867	-10,124	-8,484
Difference	306	-35	-57	0	45	44	-51	-25	244	-208	-232	114
Percent Difference (%)	-4.1	0.4	0.9	0	-1.3	-1.1	-7.4	-9.2	-6.0	2.0	2.3	-1.3
Dry (22%)												
Existing Condition	-6,008	-6,823	-6,158	-4,619	-4,004	-2,923	-295	-643	-3,286	-10,756	-9,988	-7,658
No Project/No Action Alternative	-5,777	-6,519	-6,117	-4,527	-4,112	-2,884	-329	-671	-3,228	-10,750	-9,053	-7,376
Difference	232	304	40	92	-108	39	-33	-28	57	5	935	282
Percent Difference (%)	-3.8	-4.5	-.7	-2.0	2.7	-1.3	11.5	4.4	-1.8	-0.6	-9.4	-3.7
Critical (15%)												
Existing Condition	-4,200	-3,713	-5,952	-4,057	-3,517	-1,897	-947	-1,017	-2,254	-7,537	-4,415	-4,528
No Project/No Action Alternative	-4,206	-3,674	-6,076	-3,620	-3,241	-2,140	-925	-890	-2,266	-7,060	-3,856	-4,702
Difference	-6	39	-123	436	276	-243	22	127	-12	477	560	-174
Percent Difference (%)	0.1	-1.1	2.1	-10.8	-7.8	12.8	-2.3	-12.5	0.5	-6.3	-12.7	3.8

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Changes over the long-term average would be relatively minor during all months. By water year type, Wet and Above Normal water years show that increases in reversed (negative) flow conditions would occur during several months.

Table 6-62 shows the differences between the No Project/No Action Alternative and Existing Conditions for monthly Banks and Jones pumping plant exports. It presents data for averages over the long term and by water year types.

Over the long-term average, changes in exports would be relatively minor and fluctuate between increases and reductions. By water year type, maximum reductions would occur in August of both Dry (10.7 percent) and Critical (15 percent) years.

Table 6-62
Total Banks Pumping Plant (SWP) and Jones Pumping Plant (CVP) Monthly Exports (cfs)
No Project/No Action Alternative Compared to Existing Conditions
Long-Term Average and Average by Water Year Type

Analysis Period	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	6,940	6,885	8,906	6,660	7,242	6,595	2,083	2,190	4,849	10,510	10,053	8,650
No Project/No Action Alternative	6,735	6,772	9,003	6,607	7,090	6,641	2,103	2,223	4,939	10,439	9,862	8,678
Difference	-205	-113	97	-53	-152	45	20	33	90	-71	-191	28
Percent Difference (%)	-3.0	-1.6	1.1	-0.8	-2.1	0.7	1.0	1.5	1.9	-0.7	-1.9	0.3
Water Year Types[b]												
Wet (32%)												
Existing Condition	7,323	6,603	10,095	7,856	9,480	9,319	2,847	3,298	7,398	11,371	11,478	9,539
No Project/No Action Alternative	7,183	6,578	10,254	7,946	9,341	9,359	2,920	3,449	7,640	11,445	11,719	9,931
Difference	-141	-25	159	90	-139	40	73	151	243	74	241	392
Percent Difference (%)	-1.9	-0.4	1.6	1.1	-1.5	0.4	2.6	4.6	3.3	0.6	2.1	4.1
Above Normal (15%)												
Existing Condition	7,566	6,896	9,652	6,442	7,241	7,721	1,819	1,675	6,156	10,777	11,289	9,445
No Project/No Action Alternative	7,375	6,792	9,859	6,599	6,900	7,872	1,809	1,674	6,108	10,671	11,642	9,471
Difference	-191	-104	207	157	-341	152	-10	-2	-47	-106	353	26
Percent Difference (%)	-2.5	-1.5	2.1	2.4	-4.7	2.0	-0.5	-0.1	-0.8	-1.0	3.1	0.3
Below Normal (17%)												
Existing Condition	8,258	9,017	8,887	6,291	6,885	6,753	1,736	1,666	4,204	10,977	10,594	9,676
No Project/No Action Alternative	7,868	9,015	8,928	6,246	6,778	6,701	1,733	1,669	4,085	11,150	10,734	9,450
Difference	-390	-2	41	-45	-107	-52	-4	3	-119	173	140	-226
Percent Difference (%)	-4.7	0.0	0.5	-0.7	-1.6	-0.8	-0.2	0.2	-2.8	1.6	1.3	-2.3
Dry (22%)												
Existing Condition	6,612	7,510	7,816	6,247	5,802	4,333	1,750	1,759	2,890	10,913	10,580	8,551
No Project/No Action Alternative	6,323	7,163	7,795	6,153	5,885	4,268	1,746	1,731	3,014	10,801	9,449	8,152
Difference	-289	-347	-22	-94	83	-65	-3	-28	123	-112	-1,130	-399
Percent Difference (%)	-4.4	-4.6	-0.3	-1.5	1.4	-1.5	-0.2	-1.6	4.3	-1.0	-10.7	-4.7
Critical (15%)												
Existing Condition	4,437	4,060	7,241	5,338	4,970	2,779	1,594	1,560	1,709	7,230	4,307	4,880
No Project/No Action Alternative	4,418	3,971	7,334	4,817	4,576	3,009	1,593	1,498	1,800	6,656	3,661	5,058
Difference	-19	-89	94	-521	-394	230	-1	-62	91	-573	-647	177
Percent Difference (%)	-0.4	-2.2	1.3	-9.8	-7.9	8.3	0.0	-4.0	5.3	-7.9	-15.0	3.6

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Notes:

cfs = cubic feet per second
Percent Difference (%) = Relative Difference of the monthly average.

Suisun Bay, San Pablo Bay, and San Francisco Bay

For the Suisun Bay, San Pablo Bay, and San Francisco Bay region, detailed evaluation was limited to evaluating the changes in Delta outflow, as shown in Table 6-59. Further evaluation of changes in Delta outflow on Suisun Bay, San Pablo Bay, and San Francisco Bay is included Chapter 7 Surface Water Quality and Chapter 12 Aquatic Biological Resources.

6.3.4.3 Primary Study Area – No Project/No Action Alternative

Funks and Stone Corral Creeks

Funks and Stone Corral creeks were not modeled for the No Project/No Action Alternative because the No Project/No Action Alternative does not include any modifications to Existing Conditions that would substantially affect Funks and Stone Corral creek flows.

Funks Reservoir

Changes to Funks Reservoir were not modeled for the No Project/No Action Alternative because the No Project/No Action Alternative does not include any modifications to Existing Conditions that would affect Funks Reservoir. Funks Reservoir was assumed to operate as it has historically (regulating water levels between the canals).

Colusa Basin Drain

CBD flows were not modeled for the No Project/No Action Alternative because the No Project/No Action Alternative does not include any modifications to Existing Conditions that would substantially affect CBD flows.

Other Local Creeks

Grapevine, Antelope, Hunters, and Lurline creeks were not modeled for the No Project/No Action Alternative because the No Project/No Action Alternative does not include any modifications to Existing Conditions that would substantially affect these creek flows.

6.3.5 Changes Associated with Alternatives A, B, and C

This section describes the changes to surface water resources associated with implementation of Alternatives A, B, and C.

The alternatives would be significantly integrated with the CVP and SWP systems. Consequently, the alternatives would affect operations and resultant storage, flows, and diversions associated with the CVP and SWP systems and respective streams and waterways.

Major differences in operational effects between Alternatives A, B, and C would result primarily from differences in the storage capacity of Sites Reservoir (1.27 MAF for Alternative A and 1.81 MAF for Alternatives B and C) and differences in diversion capabilities (Alternatives A and C include a 2,000 cfs Delevan Pipeline diversion and release facility, and Alternative B includes a 1,500 cfs Delevan Pipeline release-only facility).

Changes in metrics are presented comparing the alternatives to Existing Conditions and the No Project/No Action Alternative. To simplify the comparisons between the alternatives, expected changes associated with implementation of Alternatives A, B, and C relative to Existing Conditions and the No Project/No

Action Alternative are presented in summary tables. The summary tables show the long-term average and the combined Dry and Critical water years' average. Detailed modeling results with data for all water year types are included in Appendix 6B.

6.3.5.1 Extended Study Area – Alternatives A, B, and C

Changes in CVP and SWP deliveries between Alternatives A, B, and C, when compared to the No Project/No Action Alternative, are addressed in Section 6.5. Changes in San Luis Reservoir storage from Alternatives A, B, and C, when compared to Existing Conditions and the No Project/No Action Alternative, are discussed below.

San Luis Reservoir

Alternatives A, B, and C Compared to Existing Conditions

Table 6-63 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly San Luis Reservoir storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-63
San Luis Reservoir End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions (TAF)					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	697	-11 (-2%)	-11 (-2%)	-26 (-4%)	Oct	516	-27 (-5%)	-4 (-1%)	-54 (-11%)
Nov	840	14 (2%)	23 (3%)	11 (1%)	Nov	690	-2 (0%)	23 (3%)	-41 (-6%)
Dec	1,175	-2 (0%)	6 (1%)	-10 (-1%)	Dec	1,006	-38 (-4%)	-1 (0%)	-68 (-7%)
Jan	1,338	45 (3%)	52 (4%)	33 (2%)	Jan	1,257	70 (6%)	64 (5%)	23 (2%)
Feb	1,469	54 (4%)	59 (4%)	42 (3%)	Feb	1,351	104 (8%)	98 (7%)	58 (4%)
Mar	1,553	43 (3%)	48 (3%)	27 (2%)	Mar	1,337	95 (7%)	99 (7%)	56 (4%)
Apr	1,324	23 (2%)	28 (2%)	6 (0%)	Apr	1,135	83 (7%)	89 (8%)	41 (4%)
May	1,001	-7 (-1%)	-3 (0%)	-27 (-3%)	May	835	59 (7%)	66 (8%)	14 (2%)
Jun	682	-30 (-4%)	-31 (-5%)	-49 (-7%)	Jun	473	37 (8%)	34 (7%)	-1 (0%)
Jul	603	-49 (-8%)	-49 (-8%)	-65 (-11%)	Jul	446	1 (0%)	3 (1%)	-36 (-8%)
Aug	548	-58 (-11%)	-59 (-11%)	-69 (-13%)	Aug	408	-14 (-4%)	-13 (-3%)	-39 (-9%)
Sep	617	-27 (-4%)	-24 (-4%)	-41 (-7%)	Sep	442	2 (0%)	26 (6%)	-23 (-5%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Operations and criteria that affect San Luis Reservoir storage include CVP and SWP allocations, storage over the normally wet winter season, and the rate of drawdown between March (usually the beginning of the delivery season) and August.

Over the long-term averages, Alternatives A, B, and C show that storage would increase during January through April and would decrease during May through October, with maximum reductions occurring during July and August. Alternative C would result in the largest reductions (11 to 13 percent) among alternatives.

Over the Dry and Critical water year averages, Alternative A shows that storage would increase during January through June (as much as 8 percent), and storage would decrease during July through December. Alternative B shows that storage would increase in January through July and September and November, and storage would decrease in August and October. Alternative C shows that storage would increase in January through May, and storage would decrease in June through December. Alternative C would result in the largest storage reductions among the three alternatives.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-64 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly San Luis Reservoir storage. It presents data for averages over the long-term and combined Dry and Critical water years averages.

Table 6-64
San Luis Reservoir End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	653	33 (5%)	33 (5%)	18 (3%)	Oct	571	-83 (-14%)	-59 (-10%)	-110 (-19%)
Nov	784	69 (9%)	78 (10%)	66 (8%)	Nov	737	-49 (-7%)	-24 (-3%)	-88 (-12%)
Dec	1,113	60 (5%)	68 (6%)	52 (5%)	Dec	1,057	-89 (-8%)	-51 (-5%)	-118 (-11%)
Jan	1,328	55 (4%)	62 (5%)	42 (3%)	Jan	1,286	41 (3%)	35 (3%)	-6 (0%)
Feb	1,477	46 (3%)	51 (3%)	34 (2%)	Feb	1,409	46 (3%)	40 (3%)	0
Mar	1,572	24 (2%)	29 (2%)	8 (1%)	Mar	1,425	8 (1%)	12 (1%)	-31 (-2%)
Apr	1,332	16 (1%)	21 (2%)	-2 (0%)	Apr	1,229	-10 (-1%)	-4 (0%)	-52 (-4%)
May	992	2 (0%)	6 (1%)	-18 (-2%)	May	933	-39 (-4%)	-31 (-3%)	-84 (-9%)
Jun	668	-16 (-2%)	-17 (-3%)	-35 (-5%)	Jun	574	-63 (-11%)	-66 (-11%)	-101 (-18%)
Jul	583	-29 (-5%)	-29 (-5%)	-45 (-8%)	Jul	548	-101 (-19%)	-100 (-18%)	-139 (-25%)
Aug	513	-24 (-5%)	-25 (-5%)	-34 (-7%)	Aug	462	-68 (-15%)	-67 (-14%)	-92 (-20%)
Sep	584	7 (1%)	9 (2%)	-7 (-1%)	Sep	500	-57 (-11%)	-33 (-7%)	-81 (-16%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.
Note:
TAF = thousand acre-feet

Over the long-term averages, Alternatives A and B show that storage would increase during September through May, with maximum increases (up to 10 percent) occurring during November, and storage would decrease during June through August. Alternative C shows that storage would increase during October through March and decrease during April through September. Alternative C shows the greatest storage reductions among the alternatives.

Over the Dry and Critical water years averages, Alternatives A, B, and C generally show that storage decreases would occur during most months. The three alternatives show that substantial reductions would occur in June and July (as much as 25 percent), with Alternative C showing the greatest reductions among the alternatives.

6.3.5.2 Secondary Study Area – Alternatives A, B, and C

As described for the No Project/No Action Alternative, operations for the regulating reservoirs that are located within the Secondary Study Area (i.e., Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma) were not modeled. These reservoirs are assumed to continue to operate as they have historically (as regulating reservoirs), and therefore, would not experience changes in operation. In addition, Spring Creek and Suisun, San Pablo, and San Francisco bays were not modeled. Spring Creek Detention Dam is assumed to continue to operate as it has historically as a debris dam, and any changes in inflow to the bays would not be discernible.

Changes in operations resulting from implementation of Alternatives A, B, and C at the remaining facilities within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative, are discussed below.

Trinity Lake

Alternatives A, B, and C Compared to Existing Conditions

Table 6-65 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Trinity Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-65
Trinity Lake End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	1,306	45 (3%)	46 (4%)	55 (4%)	Oct	880	69 (8%)	67 (8%)	90 (10%)
Nov	1,314	49 (4%)	51 (4%)	59 (4%)	Nov	880	77 (9%)	77 (9%)	99 (11%)
Dec	1,366	46 (3%)	48 (4%)	56 (4%)	Dec	958	74 (8%)	74 (8%)	97 (10%)
Jan	1,427	44 (3%)	48 (3%)	53 (4%)	Jan	1,159	56 (5%)	61 (5%)	64 (6%)
Feb	1,537	42 (3%)	45 (3%)	51 (3%)	Feb	1,224	55 (4%)	59 (5%)	62 (5%)
Mar	1,659	39 (2%)	42 (3%)	48 (3%)	Mar	1,329	49 (4%)	56 (4%)	58 (4%)
Apr	1,807	40 (2%)	43 (2%)	48 (3%)	Apr	1,432	52 (4%)	58 (4%)	60 (4%)
May	1,803	40 (2%)	43 (2%)	48 (3%)	May	1,394	54 (4%)	60 (4%)	61 (4%)
Jun	1,767	39 (2%)	43 (2%)	47 (3%)	Jun	1,347	53 (4%)	60 (4%)	62 (5%)
Jul	1,631	40 (2%)	44 (3%)	49 (3%)	Jul	1,196	56 (5%)	59 (5%)	66 (6%)
Aug	1,494	42 (3%)	48 (3%)	52 (3%)	Aug	1,034	70 (7%)	74 (7%)	81 (8%)
Sep	1,373	44 (3%)	43 (3%)	51 (4%)	Sep	937	68 (7%)	58 (6%)	78 (8%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Increased Trinity Lake coldwater pool storage is a Project objective. An increase in the coldwater pool at Trinity Lake is considered an improvement for salmonids downstream of the dam, especially during Dry and Critical water year types.

Over the long-term averages, Alternatives A, B, and C show that increases (two to four percent) in storage would occur during all months.

Over the Dry and Critical water years averages, the alternatives show that the greatest storage increases would occur (8 to 11 percent) in the early winter (October through December).

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-66 shows the differences between Alternatives A, B and C and the No Project/No Action Alternative for monthly Trinity Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that increases (two to four percent) in storage would occur during all months.

Over the Dry and Critical water years averages, the alternatives show that the greatest storage increases would occur (8 to 11 percent) in the early winter (October through December).

Table 6-66
Trinity Lake End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project / No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	1,305	46 (4%)	47 (4%)	56 (4%)	Oct	879	70 (8%)	68 (8%)	91 (10%)
Nov	1,315	47 (4%)	50 (4%)	58 (4%)	Nov	885	71 (8%)	72 (8%)	94 (11%)
Dec	1,367	45 (3%)	48 (3%)	55 (4%)	Dec	963	69 (7%)	69 (7%)	91 (9%)
Jan	1,431	40 (3%)	44 (3%)	49 (3%)	Jan	1,170	45 (4%)	50 (4%)	53 (5%)
Feb	1,541	38 (2%)	41 (3%)	47 (3%)	Feb	1,235	44 (4%)	48 (4%)	51 (4%)
Mar	1,665	33 (2%)	35 (2%)	42 (2%)	Mar	1,341	37 (3%)	44 (3%)	46 (3%)
Apr	1,816	32 (2%)	35 (2%)	40 (2%)	Apr	1,448	36 (3%)	42 (3%)	44 (3%)
May	1,810	32 (2%)	36 (2%)	40 (2%)	May	1,409	39 (3%)	45 (3%)	46 (3%)
Jun	1,774	32 (2%)	37 (2%)	40 (2%)	Jun	1,362	38 (3%)	45 (3%)	47 (3%)
Jul	1,636	35 (2%)	40 (2%)	44 (3%)	Jul	1,204	48 (4%)	52 (4%)	58 (5%)
Aug	1,495	41 (3%)	47 (3%)	51 (3%)	Aug	1,042	62 (6%)	66 (6%)	74 (7%)
Sep	1,374	43 (3%)	42 (3%)	51 (4%)	Sep	943	63 (7%)	53 (6%)	73 (8%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

TAF = thousand acre-feet

Trinity River

Alternatives A, B, and C Compared to Existing Conditions

Table 6-67 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Trinity River flow downstream of Lewiston Reservoir. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that almost no change or reductions in flows would occur, primarily during December through April. Trinity River ROD flow criteria are reflected in Existing Conditions minimum flows (450 cfs) during August and September.

Over the Dry and Critical water years averages, the alternatives show that mostly no change in flows would occur, when compared to Existing Conditions, for almost all months except that minor increases (up to five percent) would occur during October and December. Trinity River ROD flow criteria are reflected in the minimum flows for Dry and Critical water year types, with flows of 300 cfs during November through March and flows of 450 cfs during August and September.

Table 6-67
Trinity River Monthly Flow Downstream of Lewiston Lake (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	368	5 (1%)	0	5 (1%)	Oct	361	12 (3%)	0	12 (3%)
Nov	365	5 (1%)	-4 (-1%)	3 (1%)	Nov	300	0	0	0
Dec	523	-22 (-4%)	-20 (-4%)	-18 (-4%)	Dec	300	4 (1%)	15 (5%)	13 (4%)
Jan	662	-6 (-1%)	-19 (-3%)	-13 (-2%)	Jan	300	0	0	0
Feb	644	-21 (-3%)	-38 (-6%)	-24 (-4%)	Feb	300	0	0	0
Mar	617	-38 (-6%)	-29 (-5%)	-23 (-4%)	Mar	300	0	0	0
Apr	583	-22 (-4%)	-22 (-4%)	-22 (-4%)	Apr	548	0	0	0
May	3,779	0	0	0	May	2,767	0	0	0
Jun	2,108	-17 (-1%)	-17 (-1%)	-17 (-1%)	Jun	1,064	0	0	0
Jul	923	0	0	0	Jul	580	0	0	0
Aug	450	0	0	0	Aug	450	0	0	0
Sep	450	0	-5 (-1%)	0	Sep	450	0	-15 (-3%)	0

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-68 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Trinity River flow downstream of Lewiston Lake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-68
Trinity River Monthly Flow Downstream of Lewiston Lake (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	368	5 (1%)	0	5 (1%)	Oct	361	12 (3%)	0	12 (3%)
Nov	360	9 (2%)	0	7 (2%)	Nov	300	0	0	0
Dec	522	-20 (-4%)	-19 (-4%)	-17 (-3%)	Dec	300	4 (1%)	15 (5%)	13 (4%)
Jan	655	1 (0%)	-11 (-2%)	-6 (-1%)	Jan	300	0	0	0
Feb	645	-22 (-3%)	-39 (-6%)	-25 (-4%)	Feb	300	0	0	0
Mar	575	3 (1%)	13 (2%)	19 (3%)	Mar	300	0	0	0
Apr	554	6 (1%)	6 (1%)	6 (1%)	Apr	548	0	0	0
May	3,779	0	0	0	May	2,767	0	0	0
Jun	2,091	0	0	0	Jun	1,064	0	0	0
Jul	923	0	0	0	Jul	580	0	0	0
Aug	450	0	0	0	Aug	450	0	0	0
Sep	450	0	-5 (-1%)	0	Sep	450	0	-15 (-3%)	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that reductions in flows (up to four percent) would occur primarily during December through February, and remaining months show that either no change or slight increases would occur. Trinity River ROD flow criteria are reflected in Existing Conditions minimum flows (450 cfs) in August and September.

Over the Dry and Critical water years averages, the alternatives show that mostly no change would occur, when compared to Existing Conditions, for almost all months except that minor increases in flows (three to five percent) would occur during October and December. Trinity River ROD flow criteria are reflected in the minimum flows for Dry and Critical water year types, with flows of 300 cfs during November through March and flows of 450 cfs during August and September.

Klamath River Downstream of the Trinity River

Changes to Klamath River flows downstream of the Trinity River were not modeled. The Klamath River is relatively far downstream of the Trinity River, and flow changes were modeled on the Trinity River downstream of Lewiston Reservoir.

Changes to the Trinity River downstream of Lewiston Reservoir are limited to slight reductions in spring flood spills. Flow changes would be smaller downstream at its confluence with the Klamath River, and would not be discernible considering the other flows coming together in the lower part of the watershed.

Clear Creek Tunnel

Alternatives A, B, and C Compared to Existing Conditions

Table 6-69 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Clear Creek Tunnel flow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-69
Clear Creek Tunnel Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	981	-17 (-2%)	-46 (-5%)	-61 (-6%)	Oct	755	-26 (-3%)	-143 (-19%)	-199 (-26%)
Nov	382	-75 (-20%)	-86 (-23%)	-72 (-19%)	Nov	376	-131 (-35%)	-178 (-47%)	-162 (-43%)
Dec	243	71 (29%)	73 (30%)	67 (28%)	Dec	83	38 (45%)	32 (38%)	29 (35%)
Jan	468	36 (8%)	22 (5%)	64 (14%)	Jan	667	42 (6%)	8 (1%)	126 (19%)
Feb	92	57 (62%)	97 (106%)	62 (67%)	Feb	121	33 (27%)	35 (29%)	36 (30%)
Mar	268	77 (29%)	76 (28%)	69 (26%)	Mar	152	88 (58%)	56 (37%)	67 (44%)
Apr	403	3 (1%)	-10 (-3%)	8 (2%)	Apr	359	-57 (-16%)	-40 (-11%)	-44 (-12%)
May	155	4 (3%)	-1 (0%)	6 (4%)	May	176	-26 (-15%)	-35 (-20%)	-17 (-10%)
Jun	518	34 (7%)	12 (2%)	35 (7%)	Jun	765	6 (1%)	-4 (-1%)	-14 (-2%)
Jul	1,782	-24 (-1%)	-19 (-1%)	-45 (-3%)	Jul	2,044	-53 (-3%)	4 (0%)	-78 (-4%)
Aug	1,866	-38 (-2%)	-57 (-3%)	-50 (-3%)	Aug	2,221	-227 (-10%)	-242 (-11%)	-252 (-11%)
Sep	1,660	-31 (-2%)	83 (5%)	7 (0%)	Sep	1,245	23 (2%)	277 (22%)	47 (4%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that relatively large increases in flows (some 20 percent or more) would occur during December through March. During the remainder of the year, flows for the alternatives show that minor changes would occur, except that noticeable decreases would occur during November.

Over the Dry and Critical water years averages, the alternatives show that greater increases in flows would occur during December through March. The alternatives also show that noticeable flow reductions would occur during October and November.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-70 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Clear Creek Tunnel flow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-70
Clear Creek Tunnel Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	1,033	-70 (-7%)	-98 (-9%)	-114 (-11%)	Oct	858	-129 (-15%)	-246 (-29%)	-302 (-35%)
Nov	344	-37 (-11%)	-48 (-14%)	-34 (-10%)	Nov	262	-17 (-6%)	-63 (-24%)	-48 (-18%)
Dec	257	57 (22%)	59 (23%)	54 (21%)	Dec	85	36 (42%)	30 (35%)	27 (32%)
Jan	420	83 (20%)	69 (17%)	112 (27%)	Jan	531	179 (34%)	144 (27%)	262 (49%)
Feb	95	55 (58%)	95 (101%)	60 (63%)	Feb	127	27 (21%)	29 (23%)	30 (24%)
Mar	269	75 (28%)	74 (27%)	67 (25%)	Mar	139	101 (73%)	69 (50%)	81 (58%)
Apr	389	17 (4%)	3 (1%)	22 (6%)	Apr	287	15 (5%)	31 (11%)	27 (9%)
May	168	-9 (-6%)	-14 (-9%)	-8 (-5%)	May	192	-42 (-22%)	-51 (-26%)	-33 (-17%)
Jun	551	1 (0%)	-21 (-4%)	2 (0%)	Jun	767	5 (1%)	-6 (-1%)	-16 (-2%)
Jul	1,812	-54 (-3%)	-49 (-3%)	-75 (-4%)	Jul	2,158	-166 (-8%)	-110 (-5%)	-192 (-9%)
Aug	1,926	-98 (-5%)	-117 (-6%)	-110 (-6%)	Aug	2,223	-229 (-10%)	-244 (-11%)	-254 (-11%)
Sep	1,666	-37 (-2%)	77 (5%)	1 (0%)	Sep	1,286	-18 (-1%)	236 (18%)	6 (1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that relatively large increases in flows (some 20 percent or more) would occur during December through March. During the remainder of the year, flows for the alternatives show that minor changes would occur, except that noticeable decreases would occur during October and November.

Over the Dry and Critical water years averages, the alternatives show that greater increases in flows would occur during December through March. The alternatives also show that noticeable decreases would occur during October and November.

Clear Creek Downstream of Whiskeytown Lake

Alternatives A, B, and C Compared to Existing Conditions

Table 6-71 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Clear Creek flow downstream of Whiskeytown Lake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that minor increases in flows would occur during all months.

Over the Dry and Critical water years averages, the alternatives show that greater increases in flows would occur during most months, when compared to the long-term average.

Table 6-71
Clear Creek Monthly Flow Downstream of Whiskeytown Lake (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	182	4 (2%)	4 (2%)	4 (2%)	Oct	155	12 (8%)	12 (8%)	12 (8%)
Nov	183	5 (2%)	5 (2%)	5 (2%)	Nov	156	12 (8%)	12 (8%)	12 (8%)
Dec	184	5 (3%)	5 (3%)	6 (3%)	Dec	159	15 (9%)	15 (9%)	15 (9%)
Jan	193	3 (2%)	3 (2%)	3 (2%)	Jan	173	10 (6%)	10 (6%)	10 (6%)
Feb	194	3 (2%)	3 (2%)	3 (2%)	Feb	173	10 (6%)	10 (6%)	10 (6%)
Mar	188	3 (2%)	3 (2%)	3 (2%)	Mar	173	10 (6%)	10 (6%)	10 (6%)
Apr	188	3 (2%)	3 (2%)	3 (2%)	Apr	174	8 (5%)	8 (5%)	8 (5%)
May	262	3 (1%)	3 (1%)	3 (1%)	May	243	5 (2%)	5 (2%)	5 (2%)
Jun	180	2 (1%)	2 (1%)	2 (1%)	Jun	154	2 (1%)	2 (1%)	2 (1%)
Jul	85	71[d] (84%)	22 (26%)	63 (74%)	Jul	85	53 (62%)	3 (3%)	32 (37%)
Aug	86	-1 (-2%)	-1 (-2%)	-1 (-2%)	Aug	89	-4 (-4%)	-4 (-4%)	-4 (-4%)
Sep	146	1 (1%)	1 (1%)	1 (1%)	Sep	140	3 (2%)	3 (2%)	3 (2%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

[d]These increased flows in July would not occur under the alternatives; these results are due to a poorly formulated constraint in CALSIM-II due to NODOS alternative operating criteria. These flows should have been directed down the Sacramento River at Keswick Dam. Correcting these flows would not result in material difference in any other analysis of the EIR/EIS. These higher flows should be disregarded in evaluating changes in Clear Creek flows.

Note:
cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-72 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Clear Creek flow downstream of Whiskeytown Lake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that no noticeable change in flows would occur during most months.

Over Dry and Critical water years averages, the alternatives show that no change in flows would occur during most months.

Table 6-72
Clear Creek Monthly Flow Downstream of Whiskeytown Lake (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	185	2 (1%)	2 (1%)	2 (1%)	Oct	162	5 (3%)	5 (3%)	5 (3%)
Nov	187	0	0	0	Nov	169	0	0	0
Dec	189	0	0	0	Dec	174	0	0	0
Jan	197	0	0	0	Jan	182	0	0	0
Feb	197	0	0	0	Feb	182	0	0	0
Mar	192	-1 (-1%)	-1 (-1%)	-1 (-1%)	Mar	182	0	0	0
Apr	191	0	0	0	Apr	182	0	0	0
May	265	0	0	0	May	248	0	0	0
Jun	181	0	0	0	Jun	156	0	0	0
Jul	85	71[d] (84%)	22 (26%)	63 (74%)	Jul	85	53 (62%)	3 (3%)	32 (37%)
Aug	86	-1 (-2%)	-1 (-2%)	-1 (-2%)	Aug	89	-4 (-4%)	-4 (-4%)	-4 (-4%)
Sep	148	0	0	0	Sep	143	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.
[d]These increased flows in July would not occur under the alternatives; these results are due to a poorly formulated constraint in CALSIM-II due to NODOS alternative operating criteria. These flows should have been directed down the Sacramento River at Keswick Dam. Correcting these flows would not result in material difference in any other analysis of the EIR/EIS. These higher flows should be disregarded in evaluating changes in Clear Creek flows.

Note:
cfs = cubic feet per second

Shasta Lake

Alternatives A, B, and C Compared to Existing Conditions

Table 6-73 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Shasta Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Improved coldwater pool storage in Shasta Lake is a Project operational objective. Storage improvements would provide a measure of improvement of the reliability of the coldwater pool, and storage improvements during relatively drier years are especially important.

Over the long-term averages, Alternatives A, B, and C show that slight increases in storage (maximum four percent) would occur during almost all months.

More important to the reliability of the coldwater pool are improvements in Dry and Critical water years. Over the Dry and Critical water years averages, the alternatives show that larger increases in storage would occur, when compared to Existing Conditions, than when comparing the long-term averages. The greatest relative storage increases for the alternatives (8 to 11 percent) would occur during October.

Table 6-73
Shasta Lake End of Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	2,571	77 (3%)	84 (3%)	91 (4%)	Oct	1,833	154 (8%)	193 (11%)	201 (11%)
Nov	2,549	85 (3%)	80 (3%)	86 (3%)	Nov	1,871	156 (8%)	189 (10%)	210 (11%)
Dec	2,703	50 (2%)	49 (2%)	56 (2%)	Dec	2,072	136 (7%)	172 (8%)	190 (9%)
Jan	2,979	24 (1%)	27 (1%)	37 (1%)	Jan	2,558	53 (2%)	76 (3%)	85 (3%)
Feb	3,260	-4 (0%)	-5 (0%)	8 (0%)	Feb	2,845	21 (1%)	43 (2%)	56 (2%)
Mar	3,615	11 (0%)	14 (0%)	26 (1%)	Mar	3,225	40 (1%)	57 (2%)	72 (2%)
Apr	3,910	36 (1%)	48 (1%)	50 (1%)	Apr	3,289	105 (3%)	118 (4%)	136 (4%)
May	3,939	54 (1%)	74 (2%)	68 (2%)	May	3,193	150 (5%)	166 (5%)	183 (6%)
Jun	3,635	74 (2%)	93 (3%)	91 (3%)	Jun	2,814	176 (6%)	199 (7%)	220 (8%)
Jul	3,159	69 (2%)	86 (3%)	84 (3%)	Jul	2,322	160 (7%)	198 (9%)	214 (9%)
Aug	2,825	75 (3%)	86 (3%)	84 (3%)	Aug	2,001	136 (7%)	180 (9%)	173 (9%)
Sep	2,651	80 (3%)	85 (3%)	87 (3%)	Sep	1,920	142 (7%)	183 (10%)	178 (9%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-74 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Shasta Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages. The long-term average shows that all three alternatives would have increases (a maximum of four percent) during all months.

Table 6-74
Shasta Lake End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from No Project/No Action Alternative					Change from No Project/No Action Alternative		
Month	No Project/No Action Alternative)	Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Alternative A	Alternative B	Alternative C
Oct	2,557	91 (4%)	98 (4%)	104 (4%)	Oct	1,836	150 (8%)	190 (10%)	198 (11%)
Nov	2,547	87 (3%)	82 (3%)	88 (3%)	Nov	1,892	135 (7%)	168 (9%)	189 (10%)
Dec	2,712	41 (2%)	40 (1%)	46 (2%)	Dec	2,101	108 (5%)	143 (7%)	162 (8%)
Jan	2,983	20 (1%)	22 (1%)	33 (1%)	Jan	2,569	42 (2%)	65 (3%)	74 (3%)
Feb	3,261	-5 (0%)	-6 (0%)	7 (0%)	Feb	2,853	12 (0%)	35 (1%)	47 (2%)
Mar	3,616	11 (0%)	14 (0%)	25 (1%)	Mar	3,230	35 (1%)	52 (2%)	67 (2%)
Apr	3,913	33 (1%)	45 (1%)	47 (1%)	Apr	3,296	98 (3%)	111 (3%)	129 (4%)
May	3,944	50 (1%)	70 (2%)	64 (2%)	May	3,201	141 (4%)	158 (5%)	175 (5%)
Jun	3,634	75 (2%)	94 (3%)	93 (3%)	Jun	2,813	177 (6%)	200 (7%)	221 (8%)
Jul	3,148	80 (3%)	96 (3%)	94 (3%)	Jul	2,319	163 (7%)	201 (9%)	216 (9%)
Aug	2,813	87 (3%)	98 (3%)	96 (3%)	Aug	1,998	140 (7%)	183 (9%)	176 (9%)
Sep	2,630	101 (4%)	106 (4%)	108 (4%)	Sep	1,923	139 (7%)	180 (9%)	175 (9%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

More important to the reliability of the coldwater pool are improvements in Dry and Critical water years. The alternatives show that larger increases in storage for the Dry and Critical water years averages would occur, when compared to the No Project/No Action Alternative, than for the long-term averages. The greatest relative storage increases for all three alternatives (8 to 11 percent) would occur during October.

Sacramento River

Alternatives A, B, and C Compared to Existing Conditions

Table 6-75 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Sacramento River flow downstream of Keswick Reservoir. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-75
Sacramento River Monthly Flow Downstream of Keswick Reservoir (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,248	18 (0%)	-13 (0%)	-134 (-2%)	Oct	5,660	-213 (-4%)	-270 (-5%)	-602 (-11%)
Nov	6,621	-213 (-3%)	-22 (0%)	4 (0%)	Nov	4,692	-158 (-3%)	-118 (-3%)	-308 (-7%)
Dec	6,866	656 (10%)	579 (8%)	576 (8%)	Dec	5,603	379 (7%)	315 (6%)	390 (7%)
Jan	8,252	460 (6%)	385 (5%)	364 (4%)	Jan	3,759	568 (15%)	617 (16%)	514 (14%)
Feb	10,154	552 (5%)	661 (7%)	589 (6%)	Feb	3,644	580 (16%)	606 (17%)	558 (15%)
Mar	8,553	-179 (-2%)	-245 (-3%)	-229 (-3%)	Mar	3,720	-256 (-7%)	-190 (-5%)	-234 (-6%)
Apr	6,998	-416 (-6%)	-589 (-8%)	-406 (-6%)	Apr	6,013	-1,158 (-19%)	-1,083 (-18%)	-1,126 (-19%)
May	7,881	-299 (-4%)	-426 (-5%)	-297 (-4%)	May	6,988	-762 (-11%)	-831 (-12%)	-789 (-11%)
Jun	10,711	-295 (-3%)	-307 (-3%)	-359 (-3%)	Jun	10,835	-450 (-4%)	-560 (-5%)	-649 (-6%)
Jul	13,036	-44 (0%)	58 (0%)	-8 (0%)	Jul	12,946	102 (1%)	-32 (0%)	-63 (0%)
Aug	10,467	-149 (-1%)	-72 (-1%)	-58 (-1%)	Aug	10,254	104 (1%)	24 (0%)	382 (4%)
Sep	7,909	-125 (-2%)	80 (1%)	-68 (-1%)	Sep	5,579	-85 (-2%)	188 (3%)	-88 (-2%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Sacramento River flows would be modified with implementation of the alternatives, when compared to Existing Conditions. Some changes would be directly related to Project operational objectives, such as increased coldwater pool releases from Shasta Lake for temperature improvements and stabilizing flows downstream of Keswick Reservoir to improve salmonid conditions. Other changes would be caused in a more indirect manner and are associated with other Project objectives, such as improved water supply reliability, improved Delta water quality, and other ecosystem enhancement objectives.

Over the long-term averages, Alternatives A, B, and C show that flows would increase from Existing Conditions during December through February. Flows would decrease for the alternatives during the remainder of the year.

Over the Dry and Critical water years averages, the alternatives show that noticeable increases would occur during January and February (14 to 17 percent). Flows would decrease for the three alternatives in April (18 to 19 percent) and May (11 to 12 percent).

Table 6-76 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Sacramento River flow downstream of the RBDD. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-76
Sacramento River Monthly Flow Downstream of Red Bluff Diversion Dam (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	7,032	51 (1%)	24 (0%)	-104 (-1%)	Oct	6,281	-182 (-3%)	-228 (-4%)	-559 (-9%)
Nov	8,787	-237 (-3%)	-57 (-1%)	-21 (0%)	Nov	6,556	-150 (-2%)	-116 (-2%)	-301 (-5%)
Dec	11,637	11 (0%)	-121 (-1%)	-71 (-1%)	Dec	10,274	17 (0%)	-121 (-1%)	61 (1%)
Jan	15,206	-768 (-5%)	-958 (-6%)	-883 (-6%)	Jan	6,744	-165 (-2%)	-146 (-2%)	-218 (-3%)
Feb	17,941	-663 (-4%)	-842 (-5%)	-760 (-4%)	Feb	8,053	-580 (-7%)	-545 (-7%)	-593 (-7%)
Mar	14,579	-986 (-7%)	-1,670 (-11%)	-1,214 (-8%)	Mar	7,454	-1,233 (-17%)	-1,223 (-16%)	-1,247 (-17%)
Apr	10,565	-508 (-5%)	-976 (-9%)	-574 (-5%)	Apr	7,702	-1,161 (-15%)	-1,099 (-14%)	-1,137 (-15%)
May	9,466	-222 (-2%)	-589 (-6%)	-266 (-3%)	May	7,971	-651 (-8%)	-755 (-9%)	-669 (-8%)
Jun	10,911	57 (1%)	-244 (-2%)	-7 (0%)	Jun	10,975	-222 (-2%)	-447 (-4%)	-410 (-4%)
Jul	12,412	409 (3%)	251 (2%)	433 (3%)	Jul	12,606	378 (3%)	92 (1%)	201 (2%)
Aug	9,946	-91 (-1%)	-65 (-1%)	20 (0%)	Aug	9,967	148 (1%)	83 (1%)	455 (5%)
Sep	8,154	-59 (-1%)	159 (2%)	0 (0%)	Sep	5,849	-46 (-1%)	256 (4%)	-50 (-1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Refer to the above discussion related to changes in Sacramento River flow downstream of Keswick Reservoir. The flow downstream of RBDD also reflects the effect of T-C Canal diversions to Project storage. These changes would continue downstream.

Over the long-term averages, the alternatives show that the most noticeable flow reductions would occur during January through April. Alternative B, which does not include the proposed Delevan Pipeline Intake Facilities, shows that the greatest relative decreases (11 percent) would occur in March, when compared to Alternatives A and C.

Over the Dry and Critical water years averages, the alternatives show that the most noticeable flow reductions would occur during January through April. All three alternatives show relatively similar flow reductions (14 to 17 percent) during March and April.

Table 6-77 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Sacramento River flow downstream of Hamilton City. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-77
Sacramento River Monthly Flow Downstream of Hamilton City (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Change from Existing Conditions: Alternative B	Change from Existing Conditions: Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Change from Existing Conditions: Alternative B	Change from Existing Conditions: Alternative C
Oct	6,619	28 (0%)	-21 (0%)	-95 (-1%)	Oct	5,827	-263 (-5%)	-286 (-5%)	-587 (-10%)
Nov	9,075	-282 (-3%)	-87 (-1%)	-53 (-1%)	Nov	6,734	-236 (-3%)	-182 (-3%)	-362 (-5%)
Dec	12,936	-382 (-3%)	-425 (-3%)	-462 (-4%)	Dec	11,562	-221 (-2%)	-288 (-2%)	-178 (-2%)
Jan	17,250	-937 (-5%)	-1,069 (-6%)	-1,057 (-6%)	Jan	7,467	-263 (-4%)	-215 (-3%)	-316 (-4%)
Feb	20,300	-882 (-4%)	-1,033 (-5%)	-1,009 (-5%)	Feb	9,218	-780 (-8%)	-656 (-7%)	-804 (-9%)
Mar	16,660	-1,404 (-8%)	-2,444 (-15%)	-1,748 (-10%)	Mar	8,758	-1,717 (-20%)	-1,718 (-20%)	-1,818 (-21%)
Apr	10,162	-516 (-5%)	-1,264 (-12%)	-622 (-6%)	Apr	6,364	-874 (-14%)	-1,034 (-16%)	-827 (-13%)
May	8,718	-234 (-3%)	-847 (-10%)	-296 (-3%)	May	6,610	-380 (-6%)	-715 (-11%)	-393 (-6%)
Jun	8,620	807 (9%)	-58 (-1%)	765 (9%)	Jun	8,427	831 (10%)	-134 (-2%)	679 (8%)
Jul	9,888	1,293 (13%)	530 (5%)	1,339 (14%)	Jul	10,084	1,195 (12%)	232 (2%)	1,049 (10%)
Aug	8,073	-126 (-2%)	-259 (-3%)	108 (1%)	Aug	8,171	141 (2%)	-18 (0%)	617 (8%)
Sep	7,785	-86 (-1%)	125 (2%)	-5 (0%)	Sep	5,474	-135 (-2%)	181 (3%)	-104 (-2%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Refer to the above discussion related to changes in Sacramento River flow downstream of Keswick Reservoir. The flow downstream of Hamilton City also reflects the diversions to Project storage associated with the GCID Canal conveyance.

Over the long-term averages, flows would decrease for all three alternatives during January through April, with the greatest reductions occurring during March (8 to 15 percent). Alternative B, which does not include the proposed Delevan Pipeline Intake Facilities, shows that the greatest decrease in flows would occur during March, when compared to Alternatives A and C. Alternatives A and C show that the most noticeable increase would occur during July (13 to 14 percent), when compared to Alternative B.

Over the Dry and Critical water years averages, all three alternatives show that the greatest flow reductions would occur during March and April (20 to 21 percent in March). Alternatives A and C would show the most noticeable increase in July (10 to 12 percent), when compared to Alternative B.

Table 6-78 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Sacramento River flow downstream of the proposed Delevan Pipeline Intake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-78
Sacramento River Monthly Flow Downstream of the Proposed Delevan Pipeline Intake (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,306	852 (14%)	707 (11%)	827 (13%)	Oct	5,346	503 (9%)	324 (6%)	402 (8%)
Nov	9,052	490 (5%)	730 (8%)	859 (9%)	Nov	6,550	191 (3%)	249 (4%)	329 (5%)
Dec	14,656	-598 (-4%)	-328 (-2%)	-616 (-4%)	Dec	12,838	-284 (-2%)	-175 (-1%)	-112 (-1%)
Jan	21,192	-1,611 (-8%)	-1,004 (-5%)	-1,768 (-8%)	Jan	8,810	-623 (-7%)	-196 (-2%)	-667 (-8%)
Feb	25,420	-1,474 (-6%)	-941 (-4%)	-1,634 (-6%)	Feb	11,430	-1,344 (-12%)	-581 (-5%)	-1,271 (-11%)
Mar	19,912	-1,599 (-8%)	-2,328 (-12%)	-2,033 (-10%)	Mar	10,601	-1,841 (-17%)	-1,522 (-14%)	-2,033 (-19%)
Apr	11,635	-236 (-2%)	-742 (-6%)	-356 (-3%)	Apr	6,328	-155 (-2%)	-186 (-3%)	-153 (-2%)
May	8,443	-2 (0%)	-298 (-4%)	-72 (-1%)	May	5,664	255 (5%)	216 (4%)	230 (4%)
Jun	7,819	417 (5%)	589 (8%)	431 (6%)	Jun	7,226	564 (8%)	951 (13%)	724 (10%)
Jul	8,727	1,587 (18%)	1,499 (17%)	1,615 (19%)	Jul	8,928	1,142 (13%)	1,401 (16%)	1,261 (14%)
Aug	7,319	669 (9%)	519 (7%)	1,028 (14%)	Aug	7,442	1,225 (16%)	1,010 (14%)	1,888 (25%)
Sep	7,972	943 (12%)	1,079 (14%)	1,090 (14%)	Sep	5,555	818 (15%)	974 (18%)	966 (17%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

The flow downstream of the proposed Delevan Pipeline Intake reflects the effect of diversions to Project storage.

Over the long-term averages, flows would decrease for all three alternatives during December through April, with the greatest decreases occurring during March (8 to 12 percent). All three alternatives show that noticeable flow increases would occur during July through October.

Over the Dry and Critical water years averages, all three alternatives show that a similar trend would occur, with reductions in flows during December through March. The greatest reductions would occur during March (14 to 19 percent). All three alternatives show that the greatest flow increases would occur during July through September.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-79 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Sacramento River flow downstream of Keswick Reservoir. It presents data for averages over the long term and combined Dry and Critical water years averages.

Sacramento River flows would be modified with implementation of Alternatives A. B, and C, when compared to the No Project/No Action Alternative. Some changes would be directly related to Project operational objectives, such as increased temperature releases from Shasta Lake and stabilizing flows downstream of Keswick Reservoir to improve salmonid conditions. Other changes would be caused in a more indirect manner and would be associated with other Project objectives, such as improved water supply reliability, improved Delta water quality, and other ecosystem enhancement objectives.

Table 6-79
Sacramento River Monthly Flow Downstream of Keswick Reservoir (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,191	75 (1%)	44 (1%)	-76 (-1%)	Oct	5,763	-316 (-5%)	-373 (-6%)	-705 (-12%)
Nov	6,373	35 (1%)	225 (4%)	251 (4%)	Nov	4,251	282 (7%)	323 (8%)	133 (3%)
Dec	6,696	826 (12%)	749 (11%)	746 (11%)	Dec	5,482	500 (9%)	437 (8%)	512 (9%)
Jan	8,274	438 (5%)	362 (4%)	342 (4%)	Jan	3,783	543 (14%)	593 (16%)	490 (13%)
Feb	10,211	494 (5%)	603 (6%)	532 (5%)	Feb	3,680	543 (15%)	570 (15%)	522 (14%)
Mar	8,555	-182 (-2%)	-248 (-3%)	-232 (-3%)	Mar	3,742	-278 (-7%)	-211 (-6%)	-256 (-7%)
Apr	6,942	-360 (-5%)	-533 (-8%)	-350 (-5%)	Apr	5,911	-1,056 (-18%)	-980 (-17%)	-1,024 (-17%)
May	7,866	-284 (-4%)	-411 (-5%)	-283 (-4%)	May	6,975	-749 (-11%)	-818 (-12%)	-776 (-11%)
Jun	10,846	-429 (-4%)	-442 (-4%)	-494 (-5%)	Jun	10,989	-605 (-6%)	-714 (-7%)	-804 (-7%)
Jul	13,210	-218 (-2%)	-116 (-1%)	-182 (-1%)	Jul	13,089	-40	-174 (-1%)	-205 (-2%)
Aug	10,550	-233 (-2%)	-156 (-1%)	-142 (-1%)	Aug	10,258	99 (1%)	20	377 (4%)
Sep	8,069	-285 (-4%)	-80 (-1%)	-228 (-3%)	Sep	5,532	-38 (-1%)	235 (4%)	-40 (-1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Over the long-term averages, all three alternatives show that increased flows from the No Project/No Action Alternative would occur during November through February. Flows would decrease slightly for all three alternatives during the remainder of the year.

Over the Dry and Critical water years averages, all three alternatives show that noticeable increases would occur during January and February (14 to 17 percent), and there would be noticeable reductions in flows for all three alternatives during April (17 to 18 percent) and May (11 to 12 percent).

Table 6-80 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Sacramento River flow downstream of RBDD. It presents data for averages over the long term and combined Dry and Critical water years averages.

The flow downstream of RBDD reflects the effect of T-C Canal diversions to Project storage.

Over the long-term averages, the alternatives show that the most noticeable flow reductions would occur during January through April. Alternative B, which does not include the proposed Delevan Pipeline Intake Facilities, shows that the greatest relative reductions (12 percent) would occur during March, when compared to Alternatives A and C.

Over the Dry and Critical Years averages, the alternatives show that the most noticeable flow decreases would occur during January through April. All three alternatives show relatively similar flow decreases (14 to 17 percent) during March and April.

Table 6-80
Sacramento River Monthly Flow Downstream of Red Bluff Diversion Dam (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	7,009	75 (1%)	48 (1%)	-80 (-1%)	Oct	6,421	-321 (-5%)	-367 (-6%)	-699 (-11%)
Nov	8,619	-70 (-1%)	110 (1%)	146 (2%)	Nov	6,198	208 (3%)	242 (4%)	57 (1%)
Dec	11,525	123 (1%)	-9 (0%)	41 (0%)	Dec	10,225	67 (1%)	-72 (-1%)	110 (1%)
Jan	15,263	-825 (-5%)	-1015 (-7%)	-940 (-6%)	Jan	6,823	-245 (-4%)	-225 (-3%)	-297 (-4%)
Feb	18,025	-746 (-4%)	-925 (-5%)	-843 (-5%)	Feb	8,125	-652 (-8%)	-617 (-8%)	-665 (-8%)
Mar	14,624	-1,031 (-7%)	-1,715 (-12%)	-1,260 (-9%)	Mar	7,524	-1,302 (-17%)	-1,293 (-17%)	-1,317 (-17%)
Apr	10,566	-510 (-5%)	-977 (-9%)	-575 (-5%)	Apr	7,664	-1,123 (-15%)	-1,061 (-14%)	-1,099 (-14%)
May	9,505	-261 (-3%)	-627 (-7%)	-304 (-3%)	May	8,028	-708 (-9%)	-812 (-10%)	-726 (-9%)
Jun	11,044	-76 (-1%)	-376 (-3%)	-139 (-1%)	Jun	11,162	-409 (-4%)	-634 (-6%)	-597 (-5%)
Jul	12,615	207 (2%)	48 (0%)	230 (2%)	Jul	12,822	163 (1%)	-123 (-1%)	-15 (0%)
Aug	10,052	-197 (-2%)	-172 (-2%)	-86 (-1%)	Aug	10,031	83 (1%)	19 (0%)	390 (4%)
Sep	8,336	-241 (-3%)	-23 (0%)	-182 (-2%)	Sep	5,849	-46 (-1%)	256 (4%)	-50 (-1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-81 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Sacramento River flow downstream of Hamilton City. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-81
Sacramento River Monthly Flow Downstream of Hamilton City (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,532	115 (2%)	66 (1%)	-8 (0%)	Oct	5,914	-351 (-6%)	-373 (-6%)	-674 (-11%)
Nov	8,851	-57 (-1%)	137 (2%)	172 (2%)	Nov	6,323	176 (3%)	230 (4%)	49 (1%)
Dec	12,793	-238 (-2%)	-281 (-2%)	-319 (-2%)	Dec	11,482	-141 (-1%)	-208 (-2%)	-98 (-1%)
Jan	17,292	-979 (-6%)	-1,111 (-6%)	-1,099 (-6%)	Jan	7,532	-328 (-4%)	-280 (-4%)	-381 (-5%)
Feb	20,370	-952 (-5%)	-1,102 (-5%)	-1,079 (-5%)	Feb	9,276	-838 (-9%)	-715 (-8%)	-863 (-9%)
Mar	16,703	-1,447 (-9%)	-2,486 (-15%)	-1,790 (-11%)	Mar	8,824	-1,783 (-20%)	-1,784 (-20%)	-1,884 (-21%)
Apr	10,163	-516 (-5%)	-1,264 (-12%)	-622 (-6%)	Apr	6,329	-840 (-13%)	-999 (-16%)	-792 (-13%)
May	8,656	-172 (-2%)	-785 (-9%)	-234 (-3%)	May	6,571	-341 (-5%)	-676 (-10%)	-353 (-5%)
Jun	8,665	761 (9%)	-104 (-1%)	719 (8%)	Jun	8,551	707 (8%)	-258 (-3%)	555 (6%)
Jul	9,944	1,237 (12%)	474 (5%)	1,283 (13%)	Jul	10,201	1,079 (11%)	116 (1%)	932 (9%)
Aug	8,041	-94 (-1%)	-227 (-3%)	140 (2%)	Aug	8,124	188 (2%)	30	665 (8%)
Sep	7,880	-180 (-2%)	31 (0%)	-100 (-1%)	Sep	5,388	-49 (-1%)	267 (5%)	-18 (0%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

The flow downstream of Hamilton City also reflects the diversions to Project storage associated with the GCID Canal conveyance.

Over the long-term averages, flows would decrease for all three alternatives during January through April, with the greatest reductions occurring during March (9 to 15 percent). Alternative B, which does not include the proposed Delevan Pipeline Intake Facilities, shows the greatest reduction in flows during March, when compared to Alternatives A and C. Alternatives A and C show that the most noticeable increase would occur during July (12 to 13 percent), when compared to Alternative B.

Over the Dry and Critical water years averages, the alternatives show that the greatest flow reductions would occur during March and April (20 to 21 percent in March). Alternatives A and C show that the most noticeable increase would occur during July (9 to 11 percent), when compared to Alternative B.

Table 6-82 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Sacramento River flow downstream of the proposed Delevan Pipeline Intake Facilities. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-82
Sacramento River Monthly Flow Downstream of the Proposed Delevan Pipeline Intake (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,234	923 (15%)	779 (12%)	899 (14%)	Oct	5,440	408 (8%)	230 (4%)	307 (6%)
Nov	8,862	680 (8%)	919 (10%)	1049 (12%)	Nov	6,153	588 (10%)	646 (11%)	726 (12%)
Dec	14,547	-489 (-3%)	-219 (-2%)	-507 (-3%)	Dec	12,799	-245 (-2%)	-137 (-1%)	-73 (-1%)
Jan	21,245	-1,664 (-8%)	-1,057 (-5%)	-1,821 (-9%)	Jan	8,895	-707 (-8%)	-281 (-3%)	-752 (-8%)
Feb	25,498	-1,552 (-6%)	-1,018 (-4%)	-1,712 (-7%)	Feb	11,481	-1,395 (-12%)	-633 (-6%)	-1,322 (-12%)
Mar	19,959	-1,646 (-8%)	-2,375 (-12%)	-2,080 (-10%)	Mar	10,673	-1,912 (-18%)	-1,593 (-15%)	-2,105 (-20%)
Apr	11,661	-262 (-2%)	-767 (-7%)	-382 (-3%)	Apr	6,313	-140 (-2%)	-171 (-3%)	-138 (-2%)
May	8,385	56 (1%)	-240 (-3%)	-14 (0%)	May	5,625	294 (5%)	255 (5%)	269 (5%)
Jun	7,862	374 (5%)	547 (7%)	388 (5%)	Jun	7,347	444 (6%)	831 (11%)	604 (8%)
Jul	8,770	1,544 (18%)	1,455 (17%)	1,572 (18%)	Jul	9,032	1,039 (12%)	1,297 (14%)	1,157 (13%)
Aug	7,277	711 (10%)	561 (8%)	1,070 (15%)	Aug	7,384	1,283 (17%)	1,068 (14%)	1,946 (26%)
Sep	8,066	849 (11%)	985 (12%)	996 (12%)	Sep	5,471	902 (16%)	1,057 (19%)	1,050 (19%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Flows downstream of the proposed Delevan Intake Facilities reflect the effects of diversions to and from Project storage. Generally, flows would decrease during December through April, and would increase during the remainder of the year, which corresponds with diversions to and from Project storage.

Over the long-term averages, flows would decrease for all three alternatives during December through April, with March showing the greatest reductions (8 to 12 percent). All three alternatives show that noticeable flow increases would occur during July through October.

Over the Dry and Critical water years averages, the three alternatives show that a similar trend of reductions in flows during December through March. The greatest reductions would occur during March (15 to 20 percent). All three alternatives show that the greatest flow increases would occur during July through September.

T-C Canal Intake

Alternatives A, B, and C Compared to Existing Conditions

Table 6-83 shows the differences between Alternatives A, B, and C and Existing Conditions for the monthly T-C Canal Intake flow at RBDD. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-83
Tehama-Colusa Canal Intake Monthly Flow at Red Bluff Diversion Dam (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	114	-3 (-3%)	-7 (-6%)	0	Oct	86	-1 (-1%)	-15 (-17%)	-13 (-15%)
Nov	7	103	113	104	Nov	8	77	83	81
Dec	0	702	755	703	Dec	0	430	505	399
Jan	0	1,257	1,372	1,276	Jan	0	782	811	781
Feb	3	1,238	1,526	1,373	Feb	7	1,190	1,181	1,182
Mar	17	843	1,460	1,021	Mar	18	1,016	1,073	1,053
Apr	152	133	429	209	Apr	130	45	59	52
May	436	-45 (-10%)	197 (45%)	0	May	234	-65 (-28%)	-29 (-12%)	-74 (-31%)
Jun	729	-334 (-46%)	-44 (-6%)	-335 (-46%)	Jun	396	-201 (-51%)	-84 (-21%)	-213 (-54%)
Jul	834	-379 (-45%)	-165 (-20%)	-374 (-45%)	Jul	448	-213 (-47%)	-108 (-24%)	-220 (-49%)
Aug	679	-58 (-9%)	-5 (-1%)	-79 (-12%)	Aug	412	-41 (-10%)	-53 (-13%)	-69 (-17%)
Sep	159	-56 (-35%)	-63 (-39%)	-58 (-37%)	Sep	106	-20 (-19%)	-34 (-33%)	-21 (-20%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

cfs = cubic feet per second

Percent changes are not shown for November through April because the T-C Canal diversions associated with Existing Conditions during this period are zero or very low, and diversions to fill the proposed Sites Reservoir for the alternatives would typically be highest during these months. The percent change in these months would be very large and meaningless.

Over the long-term averages, Alternatives A, B, and C show that the T-C Canal Intake flows would increase during the predominantly wet months November through April, reflecting the diversions needed to fill the proposed Sites Reservoir. In contrast, the intake flows generally would decrease during May through September with the highest reductions occurring in June and July. These reductions in T-C Canal Intake flows would be a result of one of the Project's ecosystem objectives of increasing flows in the

Sacramento River from spring through fall by reducing diversions at the T-C Canal and GCID Canal intakes and providing supplemental flows through releases from the proposed Delevan Pipeline.

Over the Dry and Critical water years averages, the alternatives show that a similar flow pattern of increases would occur during the normally wet months November through April and would decrease noticeably during June and July.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-84 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for the monthly T-C Canal Intake flow at RBDD. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-84
Tehama-Colusa Canal Intake Monthly Flow at Red Bluff Diversion Dam (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	110	0	-4 (-4%)	4 (3%)	Oct	81	5 (6%)	-9 (-11%)	-7 (-9%)
Nov	7	103	113	105	Nov	8	77	83	81
Dec	0	702	755	703	Dec	0	430	505	399
Jan	0	1,257	1,372	1,276	Jan	0	782	811	781
Feb	2	1,239	1,527	1,374	Feb	5	1,192	1,183	1,184
Mar	13	847	1,464	1,025	Mar	12	1,022	1,079	1,059
Apr	133	152	448	228	Apr	105	71	85	78
May	413	-21 (-5%)	221 (54%)	24 (6%)	May	201	-32 (-16%)	4 (2%)	-41 (-20%)
Jun	749	-354 (-47%)	-64 (-9%)	-355 (-47%)	Jun	388	-193 (-50%)	-76 (-20%)	-205 (-53%)
Jul	811	-356 (-44%)	-143 (-18%)	-352 (-43%)	Jul	390	-154 (-39%)	-49 (-13%)	-161 (-41%)
Aug	661	-40 (-6%)	12 (2%)	-61 (-9%)	Aug	365	6 (2%)	-7 (-2%)	-22 (-6%)
Sep	149	-46 (-31%)	-53 (-35%)	-49 (-32%)	Sep	82	4 (4%)	-11 (-13%)	2 (3%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

cfs = cubic feet per second

Percent changes are not shown for November through April because the T-C diversions associated with the No Project/No Action Alternative during this period are zero or very low, and diversions to fill the proposed Sites Reservoir for the alternatives would typically be highest during these months. The percent change in these months would be very large and meaningless.

Over the long-term averages, Alternatives A, B, and C show that the T-C Canal Intake flows would increase during November through April, reflecting the diversions needed to fill the proposed Sites Reservoir. In contrast, the intake flows generally would decrease during May through September with the highest reductions occurring in June and July. These reductions in T-C Canal Intake flows would be a result of one of the Project’s ecosystem objectives of increasing flows in the Sacramento River from spring through fall by reducing diversions at the T-C Canal and GCID Canal intakes and providing supplemental flows through releases from the proposed Delevan Pipeline.

Over the Dry and Critical water years averages, the alternatives show that a similar flow pattern of increases would occur during the normally wet months November through April and would decrease noticeably during June and July.

GCID Intake at Hamilton City

Alternatives A, B, and C Compared to Existing Conditions

Table 6-85 shows the differences between Alternatives A, B, and C and Existing Conditions for the monthly GCID Canal Intake flow at Hamilton City. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that GCID Canal Intake flows would increase during December through March, reflecting the diversions needed to fill the proposed Sites Reservoir. In contrast, flows would generally decrease during May through July with the highest reductions occurring in June and July (34 to 35 percent in July for Alternatives A and C). These reductions in GCID Canal Intake flows would be a result of one of the Project's ecosystem objectives of increasing flows in the Sacramento River from spring through fall by reducing diversions at the T-C Canal and GCID Canal intakes and providing supplemental flows through releases from the proposed Delevan Pipeline.

Over the Dry and Critical water years averages, the alternatives show that a similar flow pattern of increases would occur during the predominantly wet months December through March. All three alternatives show that flows would noticeably decrease during June and July (39 to 41 percent in June).

Table 6-85
Glenn-Colusa Irrigation District Canal Intake Monthly Flow at Hamilton City (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	693	21 (3%)	42 (6%)	-11 (-2%)	Oct	647	78 (12%)	55 (8%)	25 (4%)
Nov	388	45 (12%)	31 (8%)	32 (8%)	Nov	367	86 (23%)	67 (18%)	62 (17%)
Dec	179	393	304	391	Dec	171	238	166	238
Jan	69	169	111	174	Jan	73	98	69	98
Feb	54	220	191	250	Feb	55	200	111	211
Mar	38	418	774	533	Mar	49	483	493	569
Apr	2,198	-1 (0%)	279 (13%)	39 (2%)	Apr	2,313	-301 (-13%)	-79 (-3%)	-324 (-14%)
May	2,011	-15 (-1%)	232 (12%)	4 (0%)	May	1,941	-297 (-15%)	-66 (-3%)	-303 (-16%)
Jun	2,846	-780 (-27%)	-215 (-8%)	-801 (-28%)	Jun	2,755	-1,080 (-39%)	-340 (-12%)	-1,116 (-41%)
Jul	2,673	-905 (-34%)	-301 (-11%)	-928 (-35%)	Jul	2,557	-815 (-32%)	-138 (-5%)	-846 (-33%)
Aug	1,944	19 (1%)	177 (9%)	-104 (-5%)	Aug	1,815	8 (0%)	102 (6%)	-161 (-9%)
Sep	478	10 (2%)	17 (3%)	-11 (-2%)	Sep	436	75 (17%)	61 (14%)	40 (9%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:
cfs = cubic feet per second
Percent changes are not shown for December through March because GCID Canal diversions associated with Existing Conditions during this period are low, and diversions to fill the proposed Sites Reservoir for the alternatives would typically be highest during these months. The percent change in these months would be very large and meaningless.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-86 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for the monthly GCID Canal Intake flow at Hamilton City. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-86
Glenn-Colusa Irrigation District Canal Intake Monthly Flow at Hamilton City (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, b]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	753	-40 (-5%)	-18 (-2%)	-72 (-10%)	Oct	697	29 (4%)	6 (1%)	-25 (-4%)
Nov	445	-12 (-3%)	-27 (-6%)	-26 (-6%)	Nov	421	32 (8%)	12 (3%)	8 (2%)
Dec	210	361	272	360	Dec	202	207	136	208
Jan	83	154	96	159	Jan	88	84	55	84
Feb	68	206	177	236	Feb	69	186	98	197
Mar	40	416	771	531	Mar	51	480	491	567
Apr	2,190	7 (0%)	287 (13%)	47 (2%)	Apr	2,296	-284 (-12%)	-62 (-3%)	-307 (-13%)
May	2,085	-89 (-4%)	158 (8%)	-70 (-3%)	May	2,011	-367 (-18%)	-136 (-7%)	-373 (-19%)
Jun	2,903	-836 (-29%)	-272 (-9%)	-858 (-30%)	Jun	2,791	-1,116 (-40%)	-376 (-13%)	-1,152 (-41%)
Jul	2,798	-1,030 (-37%)	-426 (-15%)	-1,053 (-38%)	Jul	2,658	-916 (-34%)	-239 (-9%)	-947 (-36%)
Aug	2,066	-103 (-5%)	55 (3%)	-226 (-11%)	Aug	1,928	-105 (-5%)	-11 (-1%)	-275 (-14%)
Sep	548	-61 (-11%)	-54 (-10%)	-82 (-15%)	Sep	508	3 (1%)	-11 (-2%)	-32 (-6%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

cfs = cubic feet per second

Percent changes are not shown for December through March because GCID Canal diversions associated with the No Project/No Action Alternative during this period are low, and diversions to fill the proposed Sites Reservoir for the alternatives would typically be highest during these months. The percent change in these months would be very large and meaningless.

Over the long-term averages, Alternatives A, B, and C show that GCID Canal Intake flows would increase during December through March, reflecting the diversions needed to fill the proposed Sites Reservoir. In contrast, flows would generally decrease during May through November with the highest reductions occurring in June and July (37 to 38 percent in July for Alternatives A and C). These reductions in GCID Canal Intake flows would be a result of one of the Project's ecosystem objectives of increasing flows in the Sacramento River from spring through fall by reducing diversions at the T-C Canal and GCID Canal intakes and providing supplemental flows through releases from the proposed Delevan Pipeline.

Over the Dry and Critical water years averages, the alternatives show that a similar flow pattern of increases would occur during the predominantly wet months December through March. All three alternatives show that noticeable flow reductions would occur during June and July (40 to 41 percent in June).

Lake Oroville

Alternatives A, B, and C Compared to Existing Conditions

Table 6-87 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Lake Oroville storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-87
Lake Oroville End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	1,812	-16 (-1%)	-26 (-1%)	-24 (-1%)	Oct	1,123	36 (3%)	27 (2%)	31 (3%)
Nov	1,868	-12 (-1%)	-22 (-1%)	-19 (-1%)	Nov	1,187	34 (3%)	26 (2%)	29 (2%)
Dec	2,006	8 (0%)	-6 (0%)	4 (0%)	Dec	1,386	46 (3%)	22 (2%)	42 (3%)
Jan	2,203	11 (0%)	1 (0%)	10 (0%)	Jan	1,771	0	-4 (0%)	5 (0%)
Feb	2,405	17 (1%)	7 (0%)	9 (0%)	Feb	1,941	7 (0%)	5 (0%)	14 (1%)
Mar	2,606	17 (1%)	13 (0%)	14 (1%)	Mar	2,179	23 (1%)	17 (1%)	27 (1%)
Apr	2,879	21 (1%)	17 (1%)	18 (1%)	Apr	2,293	32 (1%)	27 (1%)	35 (2%)
May	3,015	26 (1%)	22 (1%)	23 (1%)	May	2,307	43 (2%)	41 (2%)	48 (2%)
Jun	2,908	9 (0%)	13 (0%)	5 (0%)	Jun	2,115	40 (2%)	51 (2%)	45 (2%)
Jul	2,426	3 (0%)	14 (1%)	1 (0%)	Jul	1,588	52 (3%)	77 (5%)	59 (4%)
Aug	2,135	-9 (0%)	-8 (0%)	-11 (-1%)	Aug	1,262	40 (3%)	57 (4%)	53 (4%)
Sep	1,883	-39 (-2%)	-42 (-2%)	-45 (-2%)	Sep	1,172	14 (1%)	15 (1%)	14 (1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Over the long-term averages, Alternatives A, B, and C show that storage changes would be small, with increases occurring during December through July, and reductions occurring in the remaining months.

Over the Dry and Critical water years averages, the alternatives show that small, but positive, storage increases would occur during nearly all months, with the greatest increases occurring during July and August. Relative increases would be greater than those expected over only the long-term averages.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-88 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Lake Oroville storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-88
Lake Oroville End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	1,767	29 (2%)	19 (1%)	21 (1%)	Oct	1,113	46 (4%)	37 (3%)	42 (4%)
Nov	1,826	29 (2%)	20 (1%)	23 (1%)	Nov	1,177	43 (4%)	35 (3%)	39 (3%)
Dec	1,968	45 (2%)	31 (2%)	42 (2%)	Dec	1,371	62 (4%)	37 (3%)	57 (4%)
Jan	2,170	43 (2%)	33 (2%)	43 (2%)	Jan	1,722	49 (3%)	45 (3%)	54 (3%)
Feb	2,381	41 (2%)	32 (1%)	33 (1%)	Feb	1,896	52 (3%)	50 (3%)	59 (3%)
Mar	2,591	32 (1%)	28 (1%)	29 (1%)	Mar	2,148	53 (2%)	47 (2%)	57 (3%)
Apr	2,864	36 (1%)	32 (1%)	32 (1%)	Apr	2,263	62 (3%)	57 (3%)	65 (3%)
May	3,002	40 (1%)	36 (1%)	36 (1%)	May	2,276	74 (3%)	72 (3%)	79 (3%)
Jun	2,885	32 (1%)	36 (1%)	28 (1%)	Jun	2,071	84 (4%)	94 (5%)	88 (4%)
Jul	2,399	30 (1%)	41 (2%)	28 (1%)	Jul	1,558	82 (5%)	107 (7%)	90 (6%)
Aug	2,098	28 (1%)	28 (1%)	25 (1%)	Aug	1,253	49 (4%)	65 (5%)	61 (5%)
Sep	1,831	13 (1%)	9 (1%)	7 (0%)	Sep	1,154	32 (3%)	33 (3%)	32 (3%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of Oct 1921 - Sep 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of Oct 1921 - Sep 2003.

Note:

TAF = thousand acre-feet

Over the long-term averages, Alternatives A, B, and C show that small storage increases would occur during all months.

Over the Dry and Critical water years averages, the alternatives show that small storage increases would occur during nearly all months, with the greatest increases occurring during June and July. Relative increases would be greater than those expected over the long-term averages.

Feather River

Alternatives A, B, and C Compared to Existing Conditions

Table 6-89 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Feather River flow downstream of the Thermalito Complex. It presents data for averages over the long term and combined Dry and Critical water years averages.

During September, long-term averages for all three alternatives show that an increase in flows would occur (9 percent for Alternative A, 11 percent for Alternatives B and C), and in October, all three alternatives show that a decrease would occur (between 8 and 12 percent).

During Dry and Critical water years, the same is true; there would be an increase during September for the alternatives (between 16 and 31 percent) and then a reduction in October for all three alternatives (between 9 and 18 percent).

Table 6-89
Feather River Monthly Flow Downstream of the Thermalito Complex (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, b]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	2,935	-363 (-12%)	-236 (-8%)	-327 (-11%)	Oct	1,873	-345 (-18%)	-159 (-9%)	-263 (-14%)
Nov	2,282	-82 (-4%)	-98 (-4%)	-98 (-4%)	Nov	1,355	-15 (-1%)	-45 (-3%)	-26 (-2%)
Dec	3,523	-313 (-9%)	-261 (-7%)	-367 (-10%)	Dec	2,199	-177 (-8%)	-7 (0%)	-195 (-9%)
Jan	4,739	-59 (-1%)	-107 (-2%)	-113 (-2%)	Jan	1,446	-51 (-3%)	-126 (-9%)	-28 (-2%)
Feb	5,651	-108 (-2%)	-107 (-2%)	36 (1%)	Feb	1,623	-107 (-7%)	-118 (-7%)	-111 (-7%)
Mar	6,079	-6 (0%)	-107 (-2%)	-90 (-1%)	Mar	1,812	-254 (-14%)	-243 (-13%)	-220 (-12%)
Apr	3,076	-38 (-1%)	-46 (-1%)	-38 (-1%)	Apr	1,353	-120 (-9%)	-139 (-10%)	-122 (-9%)
May	3,645	-73 (-2%)	-74 (-2%)	-75 (-2%)	May	1,559	-196 (-13%)	-222 (-14%)	-198 (-13%)
Jun	3,625	288 (8%)	157 (4%)	303 (8%)	Jun	2,966	47 (2%)	-159 (-5%)	48 (2%)
Jul	7,632	121 (2%)	-8 (0%)	87 (1%)	Jul	7,525	-89 (-1%)	-372 (-5%)	-138 (-2%)
Aug	4,837	172 (4%)	358 (7%)	201 (4%)	Aug	5,040	116 (2%)	289 (6%)	90 (2%)
Sep	4,626	437 (9%)	509 (11%)	508 (11%)	Sep	1,797	285 (16%)	550 (31%)	530 (30%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-90 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Feather River flow downstream of the Thermalito Complex. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that maximum flow increases would occur (five to six percent) during September, and maximum decreases (seven to nine percent) would occur during October and December.

Over the Dry and Critical water years averages, the alternatives show that noticeable decreases in flows (8 to 13 percent) would occur during October and December, and would also decrease (9 to 15 percent) during April and May. Flows would increase noticeably (27 to 28 percent) during August and September, when compared to the long-term average August and September flows.

Table 6-90
Feather River Monthly Flow Downstream of the Thermalito Complex (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	2,815	-243 (-9%)	-115 (-4%)	-207 (-7%)	Oct	1,751	-223 (-13%)	-37 (-2%)	-141 (-8%)
Nov	2,230	-30 (-1%)	-45 (-2%)	-46 (-2%)	Nov	1,350	-9 (-1%)	-40 (-3%)	-21 (-2%)
Dec	3,453	-243 (-7%)	-192 (-6%)	-298 (-9%)	Dec	2,282	-260 (-11%)	-91 (-4%)	-278 (-12%)
Jan	4,661	19 (0%)	-29 (-1%)	-35 (-1%)	Jan	1,354	41 (3%)	-34 (-3%)	64 (5%)
Feb	5,498	45 (1%)	46 (1%)	189 (3%)	Feb	1,571	-56 (-4%)	-67 (-4%)	-60 (-4%)
Mar	5,941	131 (2%)	30 (1%)	47 (1%)	Mar	1,603	-45 (-3%)	-34 (-2%)	-11 (-1%)
Apr	3,079	-40 (-1%)	-49 (-2%)	-41 (-1%)	Apr	1,347	-115 (-9%)	-133 (-10%)	-116 (-9%)
May	3,640	-68 (-2%)	-69 (-2%)	-70 (-2%)	May	1,581	-218 (-14%)	-244 (-15%)	-220 (-14%)
Jun	3,783	130 (3%)	-1 (0%)	145 (4%)	Jun	3,188	-176 (-6%)	-381 (-12%)	-174 (-5%)
Jul	7,723	30 (0%)	-99 (-1%)	-4 (0%)	Jul	7,387	49 (1%)	-234 (-3%)	0 (0%)
Aug	4,992	16 (0%)	202 (4%)	45 (1%)	Aug	4,680	475 (10%)	649 (14%)	449 (10%)
Sep	4,831	232 (5%)	304 (6%)	303 (6%)	Sep	1,838	244 (13%)	509 (28%)	490 (27%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Sutter Bypass

Alternatives A, B, and C Compared to Existing Conditions

Table 6-91 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Tisdale Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Tisdale Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that flow reductions would occur during the wetter months (generally November through April), with maximum flow decreases occurring during November with implementation of Alternatives A and C.

Over the Dry and Critical water years averages, the alternatives show that flow reductions would occur during November through March.

Table 6-91
Tisdale Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	9	2 (24%)	2 (23%)	1 (10%)	Oct	0	0	0	0
Nov	151	-19 (-13%)	-13 (-9%)	-18 (-12%)	Nov	77	-20 (-26%)	-17 (-22%)	-20 (-26%)
Dec	1,017	-34 (-3%)	-33 (-3%)	-56 (-6%)	Dec	791	-62 (-8%)	-23 (-3%)	-54 (-7%)
Jan	2,245	-83 (-4%)	-50 (-2%)	-111 (-5%)	Jan	184	-58 (-32%)	-43 (-23%)	-59 (-32%)
Feb	3,232	-174 (-5%)	-164 (-5%)	-225 (-7%)	Feb	531	-111 (-21%)	-81 (-15%)	-122 (-23%)
Mar	2,127	-158 (-7%)	-231 (-11%)	-171 (-8%)	Mar	220	-86 (-39%)	-103 (-47%)	-87 (-40%)
Apr	899	-26 (-3%)	-85 (-9%)	-28 (-3%)	Apr	0	0	0	0
May	89	-4 (-5%)	-18 (-21%)	-9 (-11%)	May	0	0	0	0
Jun	47	-2 (-4%)	-2 (-5%)	-2 (-4%)	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-92 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Colusa Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-92
Colusa Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	8	2 (21%)	1 (19%)	1 (10%)	Oct	0	0	0	0
Nov	133	-6 (-5%)	-6 (-4%)	-6 (-5%)	Nov	56	-17 (-31%)	-18 (-31%)	-17 (-30%)
Dec	1,336	63 (5%)	98 (7%)	51 (4%)	Dec	1,250	47 (4%)	123 (10%)	78 (6%)
Jan	3,912	-122 (-3%)	-67 (-2%)	-172 (-4%)	Jan	140	-51 (-37%)	-41 (-29%)	-52 (-37%)
Feb	5,705	-248 (-4%)	-249 (-4%)	-357 (-6%)	Feb	458	-133 (-29%)	-95 (-21%)	-132 (-29%)
Mar	3,538	-211 (-6%)	-306 (-9%)	-218 (-6%)	Mar	163	-100 (-62%)	-98 (-60%)	-100 (-62%)
Apr	1,179	-2 (0%)	-99 (-8%)	-6 (0%)	Apr	0	0	0	0
May	68	-2 (-2%)	-13 (-20%)	-8 (-12%)	May	0	0	0	0
Jun	20	-2 (-11%)	-2 (-8%)	-2 (-12%)	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Colusa Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur, primarily during January through March, and that flows would increase for the three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that noticeable flow reductions would occur primarily during January through March, and that flows would increase for the alternatives during December.

Table 6-93 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Moulton Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-93
Moulton Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	0	0	0	0	Oct	0	0	0	0
Nov	0	0	0	0	Nov	0	0	0	0
Dec	57	8 (14%)	10 (17%)	8 (14%)	Dec	68	16 (23%)	13 (18%)	20 (29%)
Jan	289	-20 (-7%)	-24 (-8%)	-19 (-7%)	Jan	0	0	0	0
Feb	464	-8 (-2%)	-25 (-5%)	-16 (-3%)	Feb	0	0	0	0
Mar	242	-17 (-7%)	-25 (-10%)	-20 (-8%)	Mar	0	0	0	0
Apr	32	-1 (-2%)	-4 (-14%)	-1 (-2%)	Apr	0	0	0	0
May	0	0	0	0	May	0	0	0	0
Jun	0	0	0	0	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Moulton Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions to the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during January through March. Flows would increase for the three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that an increase in flows would occur during December.

Table 6-94 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Ord Ferry flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-94
Ord Ferry Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Change from Existing Conditions: Alternative B	Change from Existing Conditions: Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Change from Existing Conditions: Alternative B	Change from Existing Conditions: Alternative C
Oct	0	0	0	0	Oct	0	0	0	0
Nov	0	0	0	0	Nov	0	0	0	0
Dec	60	4 (7%)	8 (13%)	3 (5%)	Dec	72	19 (26%)	8 (11%)	21 (29%)
Jan	262	-29 (-11%)	-30 (-11%)	-29 (-11%)	Jan	0	0	0	0
Feb	427	-9 (-2%)	-28 (-7%)	-17 (-4%)	Feb	0	0	0	0
Mar	189	-8 (-4%)	-15 (-8%)	-11 (-6%)	Mar	0	0	0	0
Apr	13	-1 (-4%)	-2 (-16%)	-1 (-4%)	Apr	0	0	0	0
May	0	0	0	0	May	0	0	0	0
Jun	0	0	0	0	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Ord Ferry flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during January through March, and that flows would increase for the three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that an increase in flows would occur during December.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-95 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Tisdale Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-95
Tisdale Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	8	3 (35%)	3 (34%)	2 (20%)	Oct	0	0	0	0
Nov	147	-15 (-10%)	-10 (-7%)	-15 (-10%)	Nov	66	-9 (-14%)	-6 (-9%)	-9 (-13%)
Dec	1,010	-27 (-3%)	-27 (-3%)	-50 (-5%)	Dec	787	-58 (-7%)	-19 (-2%)	-50 (-6%)
Jan	2,248	-85 (-4%)	-52 (-2%)	-113 (-5%)	Jan	194	-68 (-35%)	-53 (-27%)	-69 (-36%)
Feb	3,231	-173 (-5%)	-163 (-5%)	-224 (-7%)	Feb	534	-114 (-21%)	-84 (-16%)	-125 (-23%)
Mar	2,125	-156 (-7%)	-228 (-11%)	-169 (-8%)	Mar	214	-80 (-37%)	-97 (-45%)	-82 (-38%)
Apr	897	-25 (-3%)	-83 (-9%)	-26 (-3%)	Apr	0	0	0	0
May	89	-4 (-4%)	-18 (-20%)	-9 (-10%)	May	0	0	0	0
Jun	45	-1 (-2%)	-1 (-2%)	-1 (-2%)	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Tisdale Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during November through March.

Over the Dry and Critical water years averages, the alternatives show that flow reductions would occur during November through March.

Table 6-96 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Colusa Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Colusa Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during primarily January through March. Flows would increase for all three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that noticeable flow reductions would occur during primarily January through March, and that flows would increase for all three alternatives during December.

Table 6-96
Colusa Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	7	3 (39%)	3 (37%)	2 (28%)	Oct	0	0	0	0
Nov	126	1 (1%)	1 (1%)	1 (1%)	Nov	45	-5 (-12%)	-6 (-13%)	-5 (-12%)
Dec	1,329	70 (5%)	105 (8%)	58 (4%)	Dec	1,265	31 (2%)	107 (8%)	62 (5%)
Jan	3,917	-126 (-3%)	-72 (-2%)	-176 (-4%)	Jan	160	-71 (-44%)	-60 (-38%)	-71 (-45%)
Feb	5,723	-266 (-5%)	-267 (-5%)	-374 (-7%)	Feb	466	-141 (-30%)	-103 (-22%)	-140 (-30%)
Mar	3,523	-195 (-6%)	-290 (-8%)	-202 (-6%)	Mar	147	-84 (-57%)	-82 (-56%)	-85 (-58%)
Apr	1,174	3 (0%)	-94 (-8%)	-1 (0%)	Apr	0	0	0	0
May	68	-2 (-2%)	-14 (-20%)	-9 (-13%)	May	0	0	0	0
Jun	19	-2 (-8%)	-1 (-5%)	-2 (-9%)	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-97 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Moulton Weir flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-97
Moulton Weir Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	0	0	0	0	Oct	0	0	0	0
Nov	0	0	0	0	Nov	0	0	0	0
Dec	59	6 (11%)	8 (14%)	7 (11%)	Dec	78	6 (7%)	3 (3%)	10 (12%)
Jan	283	-14 (-5%)	-19 (-7%)	-14 (-5%)	Jan	0	0	0	0
Feb	467	-10 (-2%)	-28 (-6%)	-19 (-4%)	Feb	0	0	0	0
Mar	240	-16 (-7%)	-24 (-10%)	-18 (-8%)	Mar	0	0	0	0
Apr	32	-1 (-3%)	-5 (-15%)	-1 (-3%)	Apr	0	0	0	0
May	0	0	0	0	May	0	0	0	0
Jun	0	0	0	0	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Moulton Weir flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during January through March. Flows would increase for all three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that a slight increase in flows would occur during December.

Table 6-98 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Ord Ferry flow into the Sutter Bypass. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-98
Ord Ferry Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
	No Project/No Action Alternative	Change from No Project/No Action Alternative				No Project/No Action Alternative	Change from No Project/No Action Alternative		
Month		Alternative A	Alternative B	Alternative C	Month		Alternative A	Alternative B	Alternative C
Oct	0	0	0	0	Oct	0	0	0	0
Nov	0	0	0	0	Nov	0	0	0	0
Dec	63	2 (2%)	5 (8%)	0	Dec	88	3 (4%)	-8 (-9%)	6 (6%)
Jan	257	-24 (-10%)	-25 (-10%)	-24 (-9%)	Jan	0	0	0	0
Feb	431	-12 (-3%)	-32 (-7%)	-21 (-5%)	Feb	0	0	0	0
Mar	189	-8 (-4%)	-15 (-8%)	-11 (-6%)	Mar	0	0	0	0
Apr	14	-1 (-5%)	-2 (-17%)	-1 (-5%)	Apr	0	0	0	0
May	0	0	0	0	May	0	0	0	0
Jun	0	0	0	0	Jun	0	0	0	0
Jul	0	0	0	0	Jul	0	0	0	0
Aug	0	0	0	0	Aug	0	0	0	0
Sep	0	0	0	0	Sep	0	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Ord Ferry flows show that reductions would occur during the wetter months (generally November through April), which reflect the Sacramento River diversions for the proposed Project.

Over the long-term averages, Alternatives A, B, and C show that noticeable flow reductions would occur during January through March. Flows would increase slightly for all three alternatives during December.

Over the Dry and Critical water years averages, the alternatives show that a slight increase in flows would occur during December.

Yolo Bypass

Alternatives A, B, and C Compared to Existing Conditions

Table 6-99 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Yolo Bypass flow. It presents data for averages over the long-term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that slight increases and generally reductions in flows would occur, with a maximum reduction (10 percent) occurring during November. During September, there would be an increase (28 percent) in flows for all three alternatives.

Over the Dry and Critical water years averages, the alternatives show that the largest reduction in flows would occur during March (31 percent).

Table 6-99
Yolo Bypass Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	145	-7 (-5%)	-7 (-5%)	-13 (-9%)	Oct	48	-3 (-6%)	-1 (-3%)	-3 (-6%)
Nov	404	-42 (-10%)	-25 (-6%)	-40 (-10%)	Nov	146	-5 (-3%)	20 (14%)	4 (3%)
Dec	3,317	-193 (-6%)	-153 (-5%)	-257 (-8%)	Dec	3,249	-74 (-2%)	-74 (-2%)	-138 (-4%)
Jan	9,687	-618 (-6%)	-480 (-5%)	-691 (-7%)	Jan	432	-155 (-36%)	-79 (-18%)	-147 (-34%)
Feb	12,548	-469 (-4%)	-418 (-3%)	-552 (-4%)	Feb	1,165	-84 (-7%)	-43 (-4%)	-86 (-7%)
Mar	8,298	-348 (-4%)	-659 (-8%)	-460 (-6%)	Mar	527	-164 (-31%)	-161 (-31%)	-164 (-31%)
Apr	2,428	15 (1%)	-135 (-6%)	-9 (0%)	Apr	225	2 (1%)	2 (1%)	2 (1%)
May	267	-2 (-1%)	-26 (-10%)	-15 (-6%)	May	71	2 (3%)	2 (3%)	2 (3%)
Jun	120	5 (4%)	5 (4%)	5 (4%)	Jun	64	2 (2%)	2 (2%)	2 (2%)
Jul	47	1 (2%)	1 (2%)	1 (2%)	Jul	47	1 (2%)	1 (2%)	1 (2%)
Aug	102	-2 (-2%)	-2 (-2%)	-2 (-2%)	Aug	57	1 (2%)	1 (2%)	1 (2%)
Sep	82	23 (28%)	23 (28%)	23 (28%)	Sep	73	-1 (-1%)	-1 (-1%)	-1 (-1%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-100 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Yolo Bypass flow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-100
Yolo Bypass Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	100	39 (39%)	39 (39%)	33 (33%)	Oct	50	-5 (-10%)	-3 (-6%)	-5 (-10%)
Nov	413	-51 (-12%)	-34 (-8%)	-49 (-12%)	Nov	117	24 (21%)	50 (42%)	34 (29%)
Dec	3,334	-210 (-6%)	-169 (-5%)	-274 (-8%)	Dec	3,353	-178 (-5%)	-178 (-5%)	-242 (-7%)
Jan	9,711	-642 (-7%)	-504 (-5%)	-715 (-7%)	Jan	453	-176 (-39%)	-99 (-22%)	-167 (-37%)
Feb	12,487	-408 (-3%)	-356 (-3%)	-490 (-4%)	Feb	1,179	-98 (-8%)	-57 (-5%)	-100 (-8%)
Mar	8,325	-375 (-5%)	-686 (-8%)	-487 (-6%)	Mar	538	-175 (-33%)	-172 (-32%)	-175 (-33%)
Apr	2,476	-33 (-1%)	-183 (-7%)	-57 (-2%)	Apr	227	0	0	0
May	265	-1 (0%)	-25 (-9%)	-13 (-5%)	May	73	0	0	0
Jun	126	-1 (-1%)	-1 (-1%)	-1 (-1%)	Jun	66	0	0	0
Jul	48	0	0	0	Jul	48	0	0	0
Aug	100	0	0	0	Aug	58	0	0	0
Sep	83	22 (27%)	22 (26%)	22 (27%)	Sep	72	0	0	0

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that flows would generally decrease with a maximum reduction (12 percent) occurring during November. During September and October, there would be flow increases (26 and 39 percent, respectively).

Over the Dry and Critical water years averages, the alternatives generally show that flows would decrease in October (6 to 10 percent) and December through March (5 to 39 percent). There would be a maximum increase in flows in November (42 percent).

Folsom Lake

Alternatives A, B, and C Compared to Existing Conditions

Table 6-101 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Folsom Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-101
Folsom Lake End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	489	6 (1%)	3 (1%)	6 (1%)	Oct	331	10 (3%)	15 (4%)	12 (4%)
Nov	445	9 (2%)	4 (1%)	5 (1%)	Nov	331	17 (5%)	17 (5%)	16 (5%)
Dec	456	5 (1%)	2 (0%)	2 (0%)	Dec	363	9 (3%)	9 (3%)	9 (2%)
Jan	471	6 (1%)	1 (0%)	4 (1%)	Jan	392	16 (4%)	9 (2%)	14 (4%)
Feb	488	9 (2%)	6 (1%)	9 (2%)	Feb	436	17 (4%)	10 (2%)	16 (4%)
Mar	592	10 (2%)	7 (1%)	10 (2%)	Mar	515	20 (4%)	14 (3%)	20 (4%)
Apr	721	2 (0%)	-1 (0%)	1 (0%)	Apr	598	9 (2%)	1 (0%)	6 (1%)
May	844	0	-4 (0%)	-1 (0%)	May	647	7 (1%)	-3 (0%)	5 (1%)
Jun	817	-1 (0%)	-4 (0%)	0	Jun	592	7 (1%)	2 (0%)	10 (2%)
Jul	682	16 (2%)	4 (1%)	10 (1%)	Jul	467	10 (2%)	13 (3%)	10 (2%)
Aug	599	6 (1%)	-2 (0%)	6 (1%)	Aug	392	10 (3%)	17 (4%)	14 (4%)
Sep	509	9 (2%)	9 (2%)	11 (2%)	Sep	359	9 (2%)	22 (6%)	14 (4%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

TAF = thousand acre-feet

Generally, minor positive and negative changes in storage would occur for the long-term average. The maximum increase (two percent) would occur during July, and the maximum reduction of four TAF would occur during June. Over the long-term averages, Alternatives A, B, and C show that a slight increase would occur during September (two percent).

Over Dry and Critical water year averages, Alternatives A and C show that Folsom Lake storage would increase by one to five percent in all months. Alternative B shows that storage generally increases in all months by up to five percent, except in May where there is a small reduction of three TAF.

Table 6-102 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Folsom Lake storage. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-102
Folsom Lake End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	477	18 (4%)	16 (3%)	19 (4%)	Oct	320	21 (7%)	26 (8%)	23 (7%)
Nov	435	19 (4%)	14 (3%)	15 (3%)	Nov	323	25 (8%)	25 (8%)	24 (7%)
Dec	448	13 (3%)	10 (2%)	10 (2%)	Dec	354	19 (5%)	18 (5%)	18 (5%)
Jan	466	10 (2%)	6 (1%)	9 (2%)	Jan	384	24 (6%)	17 (4%)	22 (6%)
Feb	487	10 (2%)	7 (1%)	9 (2%)	Feb	431	22 (5%)	16 (4%)	21 (5%)
Mar	594	7 (1%)	4 (1%)	7 (1%)	Mar	519	16 (3%)	10 (2%)	16 (3%)
Apr	719	5 (1%)	2 (0%)	4 (1%)	Apr	592	15 (2%)	6 (1%)	11 (2%)
May	840	4 (0%)	0	3 (0%)	May	641	13 (2%)	2 (0%)	10 (2%)
Jun	810	6 (1%)	4 (0%)	7 (1%)	Jun	581	18 (3%)	13 (2%)	21 (4%)
Jul	666	32 (5%)	20 (3%)	26 (4%)	Jul	453	25 (6%)	28 (6%)	24 (5%)
Aug	582	23 (4%)	15 (3%)	23 (4%)	Aug	380	22 (6%)	29 (8%)	26 (7%)
Sep	496	22 (5%)	22 (4%)	24 (5%)	Sep	348	19 (6%)	32 (9%)	25 (7%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Generally, storage in Folsom Lake would increase in nearly every month for the long-term averages and Dry and Critical years average for Alternatives A, B, and C, when compared to the No Project/No Action Alternative. Storage changes would be positive during all months over the long-term average, with a maximum increase (five percent) occurring in July. Over the Dry and Critical water years averages, the alternatives show that similar increases in storage would occur in every month, with maximum increases of seven to nine percent.

American River

Alternatives A, B, and C Compared to Existing Conditions

Table 6-103 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly American River flow downstream of Lake Natoma. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-103
American River Monthly Flow Downstream of Lake Natoma (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	1,601	-41 (-3%)	3 (0%)	-15 (-1%)	Oct	1,390	-117 (-8%)	4 (0%)	-67 (-5%)
Nov	2,831	-96 (-3%)	-59 (-2%)	-23 (-1%)	Nov	1,551	-151 (-10%)	-64 (-4%)	-115 (-7%)
Dec	3,341	21 (1%)	-5 (0%)	-6 (0%)	Dec	2,812	62 (2%)	69 (2%)	58 (2%)
Jan	4,446	-40 (-1%)	-17 (0%)	-56 (-1%)	Jan	1,590	-52 (-3%)	40 (3%)	-59 (-4%)
Feb	5,173	-102 (-2%)	-118 (-2%)	-119 (-2%)	Feb	1,584	-28 (-2%)	-22 (-1%)	-30 (-2%)
Mar	3,773	-42 (-1%)	-49 (-1%)	-52 (-1%)	Mar	1,734	-49 (-3%)	-56 (-3%)	-71 (-4%)
Apr	3,290	-7 (0%)	0	14 (0%)	Apr	1,529	111 (7%)	151 (10%)	168 (11%)
May	3,603	-123 (-3%)	-108 (-3%)	-126 (-3%)	May	1,589	-38 (-2%)	-1 (0%)	-46 (-3%)
Jun	3,702	-218 (-6%)	-241 (-7%)	-256 (-7%)	Jun	2,208	-200 (-9%)	-301 (-14%)	-302 (-14%)
Jul	3,763	-539 (-14%)	-387 (-10%)	-429 (-11%)	Jul	2,747	-310 (-11%)	-436 (-16%)	-260 (-9%)
Aug	2,704	-73 (-3%)	-130 (-5%)	-170 (-6%)	Aug	2,096	-216 (-10%)	-279 (-13%)	-290 (-14%)
Sep	2,923	-241 (-8%)	-364 (-12%)	-269 (-9%)	Sep	1,574	-145 (-9%)	-241 (-15%)	-168 (-11%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Generally, over the long-term average, flows in the American River downstream of Lake Natoma for Alternatives A, B, and C would decrease in all months and would correspond to the general increase in Folsom Lake storage. The maximum flow decrease (14 percent) would occur in July. For Dry and Critical water years, flows in the American River downstream of Lake Natoma for Alternatives A, B, and C would generally decrease in all months with maximum decreases occurring during June through September (9 to 16 percent).

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-104 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly American River flow downstream of Lake Natoma. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, flows in the American River downstream of Lake Natoma for Alternatives A, B, and C would decrease in June and July with a maximum reduction (11 percent) expected to occur in July. Flows in all other months would increase or decrease slightly.

For Dry and Critical water years, flows in the American River flow downstream of Lake Natoma for Alternatives A, B, and C would decrease in June and July with a maximum reduction (nine percent) expected to occur in July. Flows in all other months would increase or decrease slightly.

Table 6-104
American River Monthly Flow Downstream of Lake Natoma (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	1,498	62 (4%)	106 (7%)	88 (6%)	Oct	1,299	-26 (-2%)	94 (7%)	24 (2%)
Nov	2,745	-10 (0%)	27 (1%)	63 (2%)	Nov	1,459	-58 (-4%)	28 (2%)	-22 (-2%)
Dec	3,268	94 (3%)	67 (2%)	67 (2%)	Dec	2,779	96 (3%)	103 (4%)	92 (3%)
Jan	4,368	38 (1%)	61 (1%)	23 (1%)	Jan	1,594	-56 (-4%)	36 (2%)	-63 (-4%)
Feb	5,068	2 (0%)	-13 (0%)	-14 (0%)	Feb	1,534	21 (1%)	27 (2%)	20 (1%)
Mar	3,686	45 (1%)	38 (1%)	35 (1%)	Mar	1,581	104 (7%)	97 (6%)	82 (5%)
Apr	3,255	29 (1%)	36 (1%)	49 (2%)	Apr	1,623	17 (1%)	57 (4%)	73 (5%)
May	3,461	19 (1%)	34 (1%)	16 (0%)	May	1,523	28 (2%)	65 (4%)	20 (1%)
Jun	3,526	-42 (-1%)	-64 (-2%)	-80 (-2%)	Jun	2,095	-86 (-4%)	-187 (-9%)	-188 (-9%)
Jul	3,640	-416 (-11%)	-265 (-7%)	-307 (-8%)	Jul	2,549	-113 (-4%)	-239 (-9%)	-63 (-2%)
Aug	2,501	130 (5%)	73 (3%)	33 (1%)	Aug	1,832	48 (3%)	-15 (-1%)	-26 (-1%)
Sep	2,679	4 (0%)	-120 (-4%)	-25 (-1%)	Sep	1,405	23 (2%)	-72 (-5%)	1 (0%)

[a]Based on CALSIM II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Sacramento-San Joaquin Delta

Alternatives A, B, and C Compared to Existing Conditions

Table 6-105 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Sacramento-San Joaquin Delta outflow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternative A shows that very slight changes would occur during all months. Alternatives B and C (which include the 1.81-MAF Sites Reservoir) show that slight decreases in outflow would occur during November through May, and that outflow increases would occur during June through October. The increased Delta outflows during June through October would be due to supplemental releases from the proposed Sites Reservoir for Delta water quality improvements.

Over the Dry and Critical water years averages, Alternative A shows that a mix of slight changes would occur during all months. When compared to Existing Conditions, Alternatives B and C show that greater fluctuations between positive and negative outflow changes would occur (than for Alternative A), with noticeably more positive outflows occurring during July through October.

Table 6-105
Sacramento-San Joaquin Delta Monthly Outflow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,015	-88 (-1%)	18 (0%)	36 (1%)	Oct	3,780	117 (3%)	337 (9%)	473 (12%)
Nov	11,701	-27 (0%)	-178 (-2%)	-136 (-1%)	Nov	6,008	-45 (-1%)	-371 (-6%)	-273 (-5%)
Dec	21,478	-32 (0%)	-628 (-3%)	-350 (-2%)	Dec	16,369	396 (2%)	343 (2%)	518 (3%)
Jan	42,346	182 (0%)	-1,675 (-4%)	-1,102 (-3%)	Jan	13,171	551 (4%)	-754 (-6%)	-261 (-2%)
Feb	51,555	97 (0%)	-1,460 (-3%)	-978 (-2%)	Feb	17,489	217 (1%)	-1,322 (-8%)	-634 (-4%)
Mar	42,576	-39 (0%)	-1,472 (-3%)	-2,353 (-6%)	Mar	16,629	-204 (-1%)	-1,834 (-11%)	-1,644 (-10%)
Apr	30,053	-165 (-1%)	-430 (-1%)	-929 (-3%)	Apr	12,052	-55 (0%)	-284 (-2%)	-297 (-2%)
May	22,456	-375 (-2%)	-387 (-2%)	-674 (-3%)	May	8,638	-146 (-2%)	-61 (-1%)	-78 (-1%)
Jun	12,771	-21 (0%)	455 (4%)	527 (4%)	Jun	6,099	101 (2%)	363 (6%)	504 (8%)
Jul	7,964	84 (1%)	1,100 (14%)	1,068 (13%)	Jul	4,717	142 (3%)	959 (20%)	864 (18%)
Aug	4,594	-1 (0%)	384 (8%)	457 (10%)	Aug	4,484	239 (5%)	646 (14%)	728 (16%)
Sep	9,715	-51 (-1%)	201 (2%)	188 (2%)	Sep	3,170	-64 (-2%)	299 (9%)	302 (10%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-106 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Delta Cross Channel flow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-106
Delta Cross Channel Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	4,723	-213 (-5%)	-176 (-4%)	-206 (-4%)	Oct	4,433	-5 (0%)	12 (0%)	-21 (0%)
Nov	4,031	-17 (0%)	-32 (-1%)	-36 (-1%)	Nov	3,661	136 (4%)	147 (4%)	157 (4%)
Dec	4,492	20 (0%)	52 (1%)	25 (1%)	Dec	3,864	44 (1%)	106 (3%)	78 (2%)
Jan	4,999	-118 (-2%)	-57 (-1%)	-138 (-3%)	Jan	2,946	-40 (-1%)	9 (0%)	-44 (-2%)
Feb	5,691	-131 (-2%)	-74 (-1%)	-129 (-2%)	Feb	3,288	-148 (-5%)	-54 (-2%)	-138 (-4%)
Mar	5,148	-150 (-3%)	-223 (-4%)	-205 (-4%)	Mar	3,177	-241 (-8%)	-203 (-6%)	-265 (-8%)
Apr	3,904	-23 (-1%)	-69 (-2%)	-32 (-1%)	Apr	2,403	-15 (-1%)	-16 (-1%)	-6 (0%)
May	3,371	-23 (-1%)	-57 (-2%)	-31 (-1%)	May	2,109	1 (0%)	-2 (0%)	-4 (0%)
Jun	5,669	75 (1%)	75 (1%)	66 (1%)	Jun	4,984	110 (2%)	119 (2%)	113 (2%)
Jul	7,701	-259 (-3%)	-411 (-5%)	-230 (-3%)	Jul	7,185	212 (3%)	165 (2%)	247 (3%)
Aug	6,529	203 (3%)	200 (3%)	288 (4%)	Aug	6,220	287 (5%)	267 (4%)	457 (7%)
Sep	5,727	188 (3%)	213 (4%)	308 (5%)	Sep	5,098	245 (5%)	355 (7%)	360 (7%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C generally show that minor flow increases and minor flow reductions would occur, with increases (three to five percent) that would occur during August and September.

Over the Dry and Critical water years averages, the alternatives show that similar flow increases would occur during August and September (four to seven percent).

Table 6-107 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Old and Middle river flows. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-107
Old and Middle River Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions			Month	Existing Conditions	Change from Existing Conditions		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	-6,178	-411	-422	-483	Oct	-5,285	222	217	169
Nov	-6,084	-658	-854	-940	Nov	-5,579	-623	-643	-527
Dec	-6,640	-83	-90	-104	Dec	-6,076	274	181	66
Jan	-3,473	-175	-192	-171	Jan	-4,394	-310	-267	-279
Feb	-3,279	31	29	20	Feb	-3,809	-79	-132	-169
Mar	-2,779	-26	-42	9	Mar	-2,512	79	-15	18
Apr	840	-99	-101	-102	Apr	-556	-35	-38	-39
May	352	-99	-99	-104	May	-793	16	21	8
Jun	-3,773	52	121	83	Jun	-2,873	66	167	63
Jul	-9,589	-29	12	-68	Jul	-9,468	23	86	-43
Aug	-9,250	-320	-250	-408	Aug	-7,759	-448	-311	-704
Sep	-7,582	-874	-985	-910	Sep	-6,406	-590	-936	-669

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that minor negative changes in flows would occur (which indicates increased reverse flows), except for maximum increases in reverse flows during September and November.

Over the Dry and Critical water years averages, the alternatives show that a mix of flow changes would occur, with the only relatively large change being maximum increases in reverse flows during September and November.

Table 6-108 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly Banks and Jones pumping plant exports. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that slight increases in exports would occur, with the greatest export increases occurring during September (10 to 11 percent) and November (10 to 14 percent).

Over the Dry and Critical water years averages, the alternatives show that a mix of changes in exports would occur, with the only noticeable changes being greater flow increases during September (8 to 13 percent) and November (9 to 11 percent).

Table 6-108
Total Banks Pumping Plant (SWP) and Jones Pumping Plant (CVP) Monthly Exports (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	6,940	400 (6%)	413 (6%)	478 (7%)	Oct	5,742	-274 (-5%)	-267 (-5%)	-216 (-4%)
Nov	6,885	676 (10%)	887 (13%)	980 (14%)	Nov	6,130	636 (10%)	657 (11%)	533 (9%)
Dec	8,906	81 (1%)	86 (1%)	103 (1%)	Dec	7,586	-305 (-4%)	-204 (-3%)	-77 (-1%)
Jan	6,660	157 (2%)	172 (3%)	151 (2%)	Jan	5,883	327 (6%)	280 (5%)	294 (5%)
Feb	7,242	-85 (-1%)	-85 (-1%)	-75 (-1%)	Feb	5,469	29 (1%)	87 (2%)	131 (2%)
Mar	6,595	0	16 (0%)	-40 (-1%)	Mar	3,712	-116 (-3%)	-12 (0%)	-48 (-1%)
Apr	2,083	27 (1%)	28 (1%)	28 (1%)	Apr	1,687	23 (1%)	27 (2%)	29 (2%)
May	2,190	40 (2%)	37 (2%)	42 (2%)	May	1,679	-17 (-1%)	-24 (-1%)	-9 (-1%)
Jun	4,849	89 (2%)	12 (0%)	53 (1%)	Jun	2,418	71 (3%)	-38 (-2%)	74 (3%)
Jul	10,510	19 (0%)	-25 (0%)	61 (1%)	Jul	9,440	-112 (-1%)	-180 (-2%)	-40 (0%)
Aug	10,053	241 (2%)	166 (2%)	336 (3%)	Aug	8,071	396 (5%)	248 (3%)	674 (8%)
Sep	8,650	836 (10%)	957 (11%)	876 (10%)	Sep	7,083	580 (8%)	955 (13%)	666 (9%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-109 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Sacramento-San Joaquin Delta outflow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Delta outflows for Alternatives A, B, and C show that decreases would occur during the wetter winter months (November through March) and relatively substantial increases would occur during July and August.

Over the Dry and Critical water years averages, the outflows of the alternatives show that relatively substantial decreases would occur during January through March. The alternatives also show that increases would occur during July through September.

Table 6-109
Sacramento-San Joaquin Delta Monthly Outflow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	5,927	106 (2%)	124 (2%)	70 (1%)	Oct	3,897	220 (6%)	355 (9%)	209 (5%)
Nov	11,674	-152 (-1%)	-109 (-1%)	-47 (0%)	Nov	5,962	-326 (-5%)	-228 (-4%)	-61 (-1%)
Dec	21,446	-596 (-3%)	-318 (-1%)	-728 (-3%)	Dec	16,765	-53 (0%)	122 (1%)	-151 (-1%)
Jan	42,528	-1,857 (-4%)	-1,284 (-3%)	-2,081 (-5%)	Jan	13,721	-1,305 (-10%)	-811 (-6%)	-1,295 (-9%)
Feb	51,653	-1,557 (-3%)	-1,076 (-2%)	-1,637 (-3%)	Feb	17,706	-1,539 (-9%)	-851 (-5%)	-1,568 (-9%)
Mar	42,537	-1,433 (-3%)	-2,315 (-5%)	-1,925 (-5%)	Mar	16,425	-1,630 (-10%)	-1,440 (-9%)	-1,885 (-11%)
Apr	29,887	-264 (-1%)	-764 (-3%)	-363 (-1%)	Apr	11,998	-229 (-2%)	-242 (-2%)	-172 (-1%)
May	22,080	-12 (0%)	-299 (-1%)	-99 (0%)	May	8,493	85 (1%)	68 (1%)	38 (0%)
Jun	12,750	476 (4%)	548 (4%)	474 (4%)	Jun	6,200	262 (4%)	403 (7%)	268 (4%)
Jul	8,048	1,016 (13%)	984 (12%)	1,071 (13%)	Jul	4,859	817 (17%)	722 (15%)	859 (18%)
Aug	4,593	384 (8%)	458 (10%)	582 (13%)	Aug	4,723	407 (9%)	489 (10%)	709 (15%)
Sep	9,663	252 (3%)	239 (2%)	406 (4%)	Sep	3,106	363 (12%)	366 (12%)	672 (22%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-110 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Delta Cross Channel flow. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C generally show that no change or minor decreases in flows would occur, except for minor increases (four to six percent) during August and September.

Over the Dry and Critical water years averages, the alternatives show that similar flow increases would occur during August and September (7 to 11 percent).

Table 6-110
Delta Cross Channel Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	4,708	-199 (-4%)	-162 (-3%)	-192 (-4%)	Oct	4,407	20	38 (1%)	5 (0%)
Nov	4,028	-14 (0%)	-28 (-1%)	-32 (-1%)	Nov	3,609	188 (5%)	199 (6%)	209 (6%)
Dec	4,507	5 (0%)	37 (1%)	10 (0%)	Dec	3,889	19 (0%)	81 (2%)	53 (1%)
Jan	5,014	-133 (-3%)	-72 (-1%)	-153 (-3%)	Jan	2,977	-71 (-2%)	-22 (-1%)	-75 (-3%)
Feb	5,702	-142 (-2%)	-84 (-1%)	-140 (-2%)	Feb	3,312	-172 (-5%)	-78 (-2%)	-162 (-5%)
Mar	5,143	-145 (-3%)	-219 (-4%)	-201 (-4%)	Mar	3,150	-214 (-7%)	-176 (-6%)	-239 (-8%)
Apr	3,909	-28 (-1%)	-74 (-2%)	-37 (-1%)	Apr	2,415	-27 (-1%)	-28 (-1%)	-18 (-1%)
May	3,347	1 (0%)	-33 (-1%)	-7 (0%)	May	2,096	14 (1%)	11 (1%)	9 (0%)
Jun	5,679	66 (1%)	66 (1%)	57 (1%)	Jun	5,032	61 (1%)	71 (1%)	64 (1%)
Jul	7,772	-331 (-4%)	-483 (-6%)	-302 (-4%)	Jul	7,104	294 (4%)	247 (3%)	328 (5%)
Aug	6,490	242 (4%)	239 (4%)	327 (5%)	Aug	5,996	511 (9%)	491 (8%)	681 (11%)
Sep	5,711	205 (4%)	230 (4%)	324 (6%)	Sep	5,015	328 (7%)	437 (9%)	443 (9%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Table 6-111 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Old and Middle river flows. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-111
Old and Middle River Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	-6,024	-566	-576	-638	Oct	-5,148	86	80	32
Nov	-6,006	-736	-932	-1018	Nov	-5,381	-820	-841	-725
Dec	-6,736	12	6	-9	Dec	-6,101	299	206	91
Jan	-3,456	-192	-210	-188	Jan	-4,164	-539	-496	-509
Feb	-3,185	-63	-65	-74	Feb	-3,764	-125	-178	-215
Mar	-2,843	38	22	73	Mar	-2,586	153	59	92
Apr	752	-11	-13	-14	Apr	-567	-23	-27	-28
May	265	-11	-12	-17	May	-759	-18	-12	-26
Jun	-3,714	-7	63	25	Jun	-2,843	37	137	34
Jul	-9,532	-86	-45	-125	Jul	-9,274	-171	-108	-237
Aug	-9,171	-399	-329	-487	Aug	-6,974	-1,232	-1,095	-1,489
Sep	-7,712	-744	-855	-781	Sep	-6,306	-689	-1035	-769

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

Over the long-term averages, Alternatives A, B, and C show that minor negative changes in flows would occur (which indicates increased reverse flows), except that maximum increases in reverse flows would occur during September and November.

Over the Dry and Critical water years averages, the alternatives show a mix of flow changes, with the only relatively large change being maximum increases in reverse flows during August, September, and November.

Table 6-112 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly Banks and Jones pumping plant exports. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A, B, and C show that substantial pumping export increases (9 to 16 percent) would occur during September through November.

Over the Dry and Critical water years averages, the alternatives show that substantial pumping export increases would occur during August (17 to 23 percent), September (11 to 16 percent), and November (13 to 15 percent).

Table 6-112
Total Banks Pumping Plant (CVP and SWP) and Jones Pumping Plant (CVP) Monthly Exports (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	6,735	606 (9%)	619 (9%)	683 (10%)	Oct	5,561	-93 (-2%)	-86 (-2%)	-35 (-1%)
Nov	6,772	789 (12%)	1,000 (15%)	1,093 (16%)	Nov	5,886	880 (15%)	901 (15%)	777 (13%)
Dec	9,003	-16 (0%)	-10 (0)%	6 (0%)	Dec	7,611	-329 (-4%)	-228 (-3%)	-102 (-1%)
Jan	6,607	210 (3%)	225 (3%)	204 (3%)	Jan	5,619	592 (11%)	545 (10%)	558 (10%)
Feb	7,090	67 (1%)	66 (1%)	77 (1%)	Feb	5,361	137 (3%)	195 (4%)	239 (4%)
Mar	6,641	-46 (-1%)	-29 (0%)	-86 (-1%)	Mar	3,764	-168 (-4%)	-65 (-2%)	-101 (-3%)
Apr	2,103	7 (0%)	8 (0%)	8 (0%)	Apr	1,685	26 (2%)	29 (2%)	31 (2%)
May	2,223	7 (0%)	4 (0%)	10 (0%)	May	1,638	24 (1%)	18 (1%)	33 (2%)
Jun	4,939	-1 (0%)	-79 (-2%)	-37 (-1%)	Jun	2,528	-40 (-2%)	-148 (-6%)	-36 (-1%)
Jul	10,439	90 (1%)	46 (0%)	132 (1%)	Jul	9,143	185 (2%)	117 (1%)	256 (3%)
Aug	9,862	432 (4%)	356 (4%)	527 (5%)	Aug	7,134	1,333 (19%)	1,185 (17%)	1,611 (23%)
Sep	8,678	808 (9%)	929 (11%)	848 (10%)	Sep	6,914	749 (11%)	1,124 (16%)	835 (12%)

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
cfs = cubic feet per second

6.3.5.3 Primary Study Area – Alternatives A, B, and C

Funks Creek and Stone Corral Creek

With implementation of either Alternative A, B, or C, Sites and Golden Gate dams would impound Funks and Stone Corral creeks. After Project construction is complete, maintenance flows up to a maximum of 10 cfs would be maintained in both Funks and Stone Corral creeks downstream of Sites Reservoir (refer to Chapter 9 Flood Control and Management and Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives for additional details).

Funks Reservoir

The existing Funks Reservoir is a reregulating reservoir that balances water level operations of the T-C Canal upstream and downstream of Funks Creek. With implementation of the Project, Funks Reservoir would be expanded to form Holthouse Reservoir by constructing a new dam (Holthouse Dam) and reservoir to the east of Funks Reservoir, and breaching the existing Funks Dam so that the new and existing reservoirs would act as one unit with an enlarged active storage capacity of approximately 6,500 acre-feet and a surface area of approximately 450 acres. Holthouse Reservoir would be required for the Project to facilitate balancing and regulating Sites Reservoir inflows and outflows through the Sites Pumping/Generating Plant, and to provide sufficient supplemental storage to allow simultaneous pump back power generation.

Colusa Basin Drain

The CBD conveys runoff and agricultural return flows from approximately one million acres of watershed in the Colusa Basin and discharges the flows to the Sacramento River at Knights Landing. The CBD also collects flood flows from the local creeks within the Primary Study Area. During high flows, flows in the CBD are diverted to Yolo Bypass through the Knights Landing Ridge Cut.

The operation of Sites Reservoir would reduce potential flood flow impacts primarily from Funks and Stone Corral creeks, as well as from Grapevine and Antelope creeks, which are located within the proposed Sites Reservoir Inundation Area. Flows from these creeks would be regulated by Sites and Golden Gate dams through releases of low maintenance flows. Hunters and Lurline creeks, which flow into the CBD, would not be affected by Sites Reservoir's operation.

The CBD would, therefore, change from an unregulated sporadic flow that is responsive to local storms to a regulated low maintenance flow resulting from the reduced drainage from Funks, Stone Corral, Grapevine and Antelope creeks once Sites Reservoir becomes operational.

Other Local Creeks

Many small tributaries exist within the Primary Study Area, including Grapevine Creek, Antelope Creek, Hunters Creek, and Lurline Creek.

Grapevine and Antelope creeks are located within the proposed Sites Reservoir Inundation Area; flows from both of these creeks would be reduced with operation of Sites Reservoir.

Hunters Creek (located north of Sites Reservoir) flows to the east. Lurline Creek (located southeast of Sites Reservoir) flows to the east. Hunters and Lurline creeks flow into the CBD. The operation of Sites Reservoir would not affect Hunters and Lurline creeks.

Sites Reservoir

Alternatives A, B, and C Compared to Existing Conditions

Table 6-113 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly storage at the proposed Sites Reservoir. It presents data for averages over the long term and combined Dry and Critical water years averages.

Table 6-113
Proposed Sites Reservoir End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Oct	0	633	902	1049	Oct	0	365	452	623
Nov	0	596	862	1004	Nov	0	348	433	591
Dec	0	679	924	1084	Dec	0	394	469	628
Jan	0	812	1013	1220	Jan	0	595	770	938
Feb	0	926	1106	1349	Feb	0	703	837	1041
Mar	0	1017	1237	1463	Mar	0	803	921	1154
Apr	0	1012	1253	1465	Apr	0	750	876	1103
May	0	985	1235	1441	May	0	682	805	1034
Jun	0	934	1171	1386	Jun	0	620	710	949
Jul	0	826	1068	1276	Jul	0	552	613	862
Aug	0	759	1014	1192	Aug	0	471	540	758
Sep	0	687	947	1114	Sep	0	412	491	688

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Across both the long-term averages and water year types, reservoir storage would decline to a minimum in November, increase during December through April to its maximum, and then decrease during May through October.

Although Alternatives B and C would both include the larger reservoir size (1.81-MAF), Alternative C would have more water in storage in Sites Reservoir than Alternative B. This increased storage would result from differences in diversion and conveyance capacities between the alternatives associated with the Delevan Pipeline Intake Facilities and the Delevan Pipeline Discharge facility.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-114 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly storage at the proposed Sites Reservoir. It presents data for averages over the long term and combined Dry and Critical water years averages.

Across both the long-term averages and water year types, reservoir storage would decline to a minimum in November, increase during December through April to its maximum, and then decrease during May through October.

Although Alternatives B and C would both include the larger reservoir size (1.81-MAF), Alternative C's reservoir would have more water in storage in Sites Reservoir than Alternative B. This increased storage would result from differences in diversion and conveyance capacities between the alternatives associated with the Delevan Pipeline Intake Facilities and the Delevan Pipeline Discharge facility.

Table 6-114
Proposed Sites Reservoir End-of-Month Storage (TAF)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C	Month	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Oct	0	633	902	1,049	Oct	0	365	452	623
Nov	0	596	862	1,004	Nov	0	348	433	591
Dec	0	679	924	1,084	Dec	0	394	469	628
Jan	0	812	1,013	1,220	Jan	0	595	770	938
Feb	0	926	1,106	1,349	Feb	0	703	837	1,041
Mar	0	1,017	1,237	1,463	Mar	0	803	921	1,154
Apr	0	1,012	1,253	1,465	Apr	0	750	876	1,103
May	0	985	1,235	1,441	May	0	682	805	1,034
Jun	0	934	1,171	1,386	Jun	0	620	710	949
Jul	0	826	1,068	1,276	Jul	0	552	613	862
Aug	0	759	1,014	1,192	Aug	0	471	540	758
Sep	0	687	947	1,114	Sep	0	412	491	688

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

TAF = thousand acre-feet

Delevan Pipeline Intake Facilities

Alternatives A, B, and C Compared to Existing Conditions

Table 6-115 shows the differences between Alternatives A, B, and C and Existing Conditions for monthly flow at the proposed Delevan Pipeline Intake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages, Alternatives A and C show that increases would occur during the late winter (December through March) and late summer (June and July). Over the Dry and Critical water years averages, Alternatives A and C show that an increase in diversions would occur during December through July. During June and July, upstream GCID and T-C canal flows would be supplemented by Delevan Pipeline flows.

Alternative B does not include the Delevan Pipeline Intake Facilities.

Table 6-115
Proposed Delevan Pipeline Intake Monthly Flow (cfs)
Alternatives A, B, and C Compared to Existing Conditions

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
		Change from Existing Conditions					Change from Existing Conditions		
Month	Existing Conditions	Alternative A	Alternative B	Alternative C	Month	Existing Conditions	Alternative A	Alternative B	Alternative C
Oct	0	7	0	16	Oct	0	0	0	6
Nov	0	55	0	55	Nov	0	26	0	27
Dec	0	343	0	335	Dec	0	180	0	180
Jan	0	761	0	806	Jan	0	391	0	391
Feb	0	655	0	776	Feb	0	610	0	610
Mar	0	308	0	406	Mar	0	348	0	460
Apr	0	68	0	71	Apr	0	186	0	193
May	0	66	0	78	May	0	180	0	213
Jun	0	694	0	690	Jun	0	778	0	622
Jul	0	468	0	485	Jul	0	704	0	560
Aug	0	19	0	16	Aug	0	13	0	13
Sep	0	7	0	2	Sep	0	20	0	7

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-116 shows the differences between Alternatives A, B, and C and the No Project/No Action Alternative for monthly flow at the proposed Delevan Pipeline Intake. It presents data for averages over the long term and combined Dry and Critical water years averages.

Over the long-term averages and across all water year types with implementation of Alternatives A and C, flows would increase during the predominantly wet months of December through March, reflecting the withdrawals needed to fill the proposed Sites Reservoir. Pipeline releases would increase during the dry summer months of June and July. During June through August, upstream GCID and T-C canal flows would be supplemented by Delevan Pipeline flows.

In contrast, Alternative B does not include the Delevan Pipeline Intake Facility.

Table 6-116
Proposed Delevan Pipeline Intake Monthly Flow (cfs)
Alternatives A, B, and C Compared to the No Project/No Action Alternative

Long-Term Average[a, b]					Dry and Critical Water Years Average[a, c]				
Month	No Project/No Action Alternative	Change from No Project/No Action Alternative			Month	No Project/No Action Alternative	Change from No Project/No Action Alternative		
		Alternative A	Alternative B	Alternative C			Alternative A	Alternative B	Alternative C
Oct	0	7	0	16	Oct	0	0	0	6
Nov	0	55	0	55	Nov	0	26	0	27
Dec	0	343	0	335	Dec	0	180	0	180
Jan	0	761	0	806	Jan	0	391	0	391
Feb	0	655	0	776	Feb	0	610	0	610
Mar	0	308	0	406	Mar	0	348	0	460
Apr	0	68	0	71	Apr	0	186	0	193
May	0	66	0	78	May	0	180	0	213
Jun	0	694	0	690	Jun	0	778	0	622
Jul	0	468	0	485	Jul	0	704	0	560
Aug	0	19	0	16	Aug	0	13	0	13
Sep	0	7	0	2	Sep	0	20	0	7

[a]Based on CALSIM II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:

cfs = cubic feet per second

6.4 Evaluation of Changes to Operational Flexibility

The existing State and federal water systems, SWP and CVP, respectively, have become relatively rigid in terms of timing, location, and quantity of stored and released water. This lack of flexibility creates difficulty in addressing many of the challenges facing California's water managers, including drought impacts, flood risk, declining ecosystems, impaired water quality, and climate change. As described in Chapter 1 Introduction, having more water in storage would improve the operational flexibility of California's major water systems and would give water managers the ability to develop more solutions to respond to California's water resources challenges.

Changes in CVP and SWP storage associated with implementation of Alternatives A, B, and C, when compared to Existing Conditions and the No Project/No Action Alternative, are discussed below.

6.4.1 Total North-of-the-Delta CVP and SWP Reservoir Storage

Table 6-117 shows the differences in total annual North-of-the-Delta storage between Alternatives A, B, and C, when compared to Existing Conditions and the No Project/No Action Alternative. It presents data for averages over the long term and combined Dry and Critical water years averages. Total North-of-the-Delta storage combines the Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and the proposed Sites Reservoir storages.

A comparison of the long-term averages and Dry and Critical water years averages of the total North-of-the-Delta storage for Alternatives A, B, and C with Existing Conditions and the No Project/No

Action Alternative indicates that there would be additional operational flexibility provided by the proposed Sites Reservoir.

Table 6-117
Total Annual North-of-the-Delta Storage[a] (TAF)

Long-Term Average[b, c]					Dry and Critical Water Years Average[b, d]				
	Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C		Existing Conditions	Change from Existing Conditions: Alternative A	Alternative B	Alternative C
Annual	7,628	927 (12%)	1,167 (15%)	1,373 (18%)	Annual	6,070	791 (13%)	953 (16%)	1,173 (19%)
	No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C		No Project/No Action Alternative	Change from No Project/No Action Alternative: Alternative A	Alternative B	Alternative C
Annual	7,591	964 (13%)	1,205 (16%)	1,410 (19%)	Annual	6,040	821 (14%)	983 (16%)	1,203 (20%)

[a]For Existing Conditions and the No Project / No Action Alternative, total annual storage combines Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake storage. For Alternatives A, B, and C, the storage for the same four reservoirs is combined with the proposed Sites Reservoir storage.
[b]Based on CALSIM II modeling over an 82-year simulation period.
[c]Long-Term is the average quantity for the period of October 1921 through September 2003.
[d]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Note:
TAF = thousand acre-feet

Alternatives A, B, and C show that substantial increases in total North-of-the-Delta storage would occur. Some of the increase in total North-of-the-Delta storage would be associated with increases at the existing reservoirs, and some would be associated with water in storage at the proposed Sites Reservoir. Over the long-term averages, total storage would increase, when comparing Alternatives A, B, and C, reflecting the differences in Sites Reservoir design capacity as well as differences in conveyance to the reservoir.

For example, over the long-term average, Alternative A includes the smaller Sites Reservoir (with a storage capacity of 1.27 MAF) and would result in the smallest total North-of-the-Delta storage increase of 927 TAF (12 percent), when compared to Existing Conditions, and 964 TAF (13 percent), when compared to the No Project/No Action Alternative.

Alternatives B and C both include the larger 1.81-MAF Sites Reservoir, and over the long-term average both show that larger total North-of-the-Delta storage increases would occur when compared to Existing Conditions (increases of 1,167 TAF [15 percent], and 1,373 TAF [18 percent], respectively) and the No Project/No Action Alternative (increases of 1,205 TAF [16 percent], and 1,410 TAF [19 percent], respectively).

Over the Dry and Critical water years average, Alternative A would result in a total North-of-the-Delta storage increase of 791 TAF (13 percent), when compared to the Existing Conditions, and 821 TAF (14 percent), when compared to the No Project/No Action Alternative. Alternative B would result in a total North-of-the-Delta storage increase of 953 TAF (16 percent), when compared to the Existing Conditions, and 983 TAF (16 percent), when compared to the No Project/No Action Alternative. Alternative C would result in a total North-of-the-Delta storage increase of 1,173 TAF (19 percent), when compared to the Existing Conditions, and 1,203 TAF (20 percent), when compared to the No Project/No Action Alternative.

Although Alternatives B and C would have the same reservoir storage size, the approximately 200 TAF storage difference between those alternatives reflects the difference in intake and conveyance capacity to Sites Reservoir between Alternative C and Alternative B. Alternative C includes the 2,000 cfs Delevan

Pipeline Intake Facilities; whereas, Alternative B has no diversion capability at the Delevan Pipeline (it instead has the Delevan Pipeline Discharge Facility).

6.5 Water Supply Impacts

6.5.1 Water Supply Reliability

Water supply reliability is defined as delivering a specific quantity of water with a determined frequency to a particular location at a particular time. Reliability indicates an acceptable level of dependability of water delivery to the users receiving it. Local, regional, California, and federal governments, and water suppliers, all have a role in water resource sustainability and improving water supply reliability for the existing and future population and the environment.

Water supply reliability is complicated by the need for consistent and efficient delivery of water to environmental, agricultural, and urban users. During prolonged droughts, water supplies are less reliable, which increases competition and can lead to conflict between water users.

Climate change threatens to further reduce water supply reliability throughout California. The potential effects of climate change, including the effects upon the alternatives, are discussed in Chapter 25 Climate Change and Greenhouse Gas Emissions.

The effects of implementation of Alternatives A, B, and C on water supply reliability are evaluated below.

6.5.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. For the purposes of this analysis, an alternative would result in a significant impact on water supply reliability if it would result in the following:

- A decrease in average annual CVP or SWP deliveries of greater than one percent with implementation of Alternatives A, B, and C, when compared to deliveries associated with the No Project/No Action Alternative.

A significance criterion value of one percent was selected to avoid consideration of minor fluctuations in model output due to simulation techniques.

No significance determination was made for the comparison of Alternatives A, B, and C CVP and SWP deliveries with Existing Conditions. Inherent in the differences in CVP and SWP deliveries between Alternatives A, B, and C and Existing Conditions are the differences in assumptions between the No Project/No Action Alternative and Existing Conditions. There are significant differences in key assumptions relating to increase in demands and build-out of facilities associated with CVP contracts (particularly M&I contract deliveries in the American River Basin), Level 2 supplies for wildlife refuges, increase in non-project water rights in the American River Basin, and new urban water intakes/Delta export facilities between the No Project/No Action Alternative and Existing Conditions, as described in Section 6.3.2.1. The differences in CVP and SWP deliveries between the No Project/No Action Alternative and Existing Conditions that are attributed to the differences in key assumptions are shown in Tables 6-37 and 6-38. Because the differences in CVP and SWP deliveries for Alternatives A, B, and C, when compared to Existing Conditions, are attributed to the differences in key assumptions between the

No Project/No Action Alternative and Existing Conditions and not the Project, it is not appropriate to make a significance determination for these comparisons.

6.5.2.1 Impact Assessment Methodology

CVP and SWP water supply allocations and the ability to divert from the south Delta intakes are determined in accordance with federal and State regulations. Factors that affect CVP and SWP water supply availability include CVP and SWP reservoir storage and Delta outflow requirements. CVP and SWP water supply allocations are calculated based upon current year hydrologic conditions and resultant reservoir storage. Overall, there are many factors that are considered in the determination of CVP and SWP deliveries and Delta exports.

For the purpose of this analysis, CVP and SWP water supply reliability was evaluated as a function of only CVP and SWP service area deliveries. The analysis of changes in CVP and SWP water service area deliveries compares simulated water supply conditions based upon CALSIM II results.

As discussed previously, there would be some changes between Existing Conditions and the No Project/No Action Alternative, such as a 2009 level of demand for Existing Conditions and a 2030 level of demand for the No Project/No Action Alternative. The level of demand change is one of several changes associated with implementation of the No Project/No Action Alternative. Refer to Section 6.3.2.1 for a more detailed discussion of key changes between Existing Conditions and the No Project/No Action Alternative, which are reflected in the modeling results.

Water supply reliability was evaluated based upon comparisons of CVP and SWP total annual water deliveries associated with Alternatives A, B, and C, when compared to the No Project/No Action Alternative, and is presented below. Water supply reliability is presented, but not evaluated, for Existing Conditions for total annual water deliveries and regional water deliveries. Regional water deliveries are also presented, but not evaluated, for the No Project/No Action Alternative.

6.5.2.2 Evaluation Results

CVP Contract Deliveries

Alternatives A, B, and C Compared to Existing Conditions

Table 6-118 shows the differences between Alternatives A, B, and C and Existing Conditions for annual CVP deliveries for the hydrologic regions within the Extended Study Area by water service type. It presents data for averages over the long-term and combined Dry and Critical water years averages.

Table 6-118
Annual CVP Deliveries (TAF)[a]
Alternatives A, B, and C Compared to Existing Conditions

Region and Delivery Type		Average (Annual)	EXC (TAF)	Change from Existing Conditions		
				Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
Sacramento River Hydrologic Region						
CVP Settlement	Contract Delivery	Long-Term[b]	1,908	35 (2%)	31 (2%)	34 (2%)
		Dry and Critical[c]	1,895	37 (2%)	28 (2%)	37 (2%)
CVP Refuge Level 2	Contract Delivery	Long-Term	129	30 (23%)	29 (22%)	32 (24%)
		Dry and Critical	115	26 (22%)	25 (21%)	27 (23%)
Refuge Level 4	Supply from acquisitions	Long-Term	10	16 (160%)	16 (160%)	15 (150%)

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Table 6-118
Annual CVP Deliveries (TAF)[a]
Alternatives A, B, and C Compared to Existing Conditions

Region and Delivery Type		Average (Annual)	EXC (TAF)	Change from Existing Conditions: Alternative A (TAF/%)	Change from Existing Conditions: Alternative B (TAF/%)	Change from Existing Conditions: Alternative C (TAF/%)
		Dry and Critical	10	16 (165%)	15 (158%)	15 (158%)
	Supply from NODOS	Long-Term	0	1 (0%)	1 (0%)	2 (0%)
		Dry and Critical	0	0 (0%)	1 (0%)	1 (0%)
CVP M&I	Contract Delivery	Long-Term	85	127 (151%)	126 (149%)	128 (151%)
		Dry and Critical	74	101 (136%)	101 (135%)	102 (136%)
CVP Ag	Contract Delivery (does not include Settlement contractors)	Long-Term	223	-1 (0%)	-7 (-3%)	-1 (0%)
		Dry and Critical	112	-9 (-8%)	-14 (-13%)	-10 (-8%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)						
CVP Exchange	Contract Delivery	Long-Term	852	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	814	0 (0%)	0 (0%)	0 (0%)
CVP Refuge Level 2	Contract Delivery	Long-Term	281	-20 (-7%)	-20 (-7%)	-20 (-7%)
		Dry and Critical	267	-18 (-7%)	-18 (-7%)	-18 (-7%)
Refuge Level 4	Supply from acquisitions	Long-Term	62	-10 (-16%)	-32 (-52%)	-34 (-55%)
		Dry and Critical	59	6 (10%)	-6 (-11%)	-6 (-11%)
	Supply from NODOS	Long-Term	0	35	56	58
		Dry and Critical	0	17	30	29
CVP M&I	Contract Delivery	Long-Term	16	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	13	0 (0%)	0 (0%)	0 (0%)
CVP Ag	Contract Delivery (does not include Exchange contractors)	Long-Term	289	7 (2%)	-1 (0%)	4 (1%)
		Dry and Critical	148	-1 (-1%)	-9 (-6%)	-5 (-3%)
San Francisco Bay Hydrologic Region						
CVP M&I	Contract Delivery	Long-Term	225	66 (29%)	65 (29%)	66 (29%)
		Dry and Critical	224	95 (43%)	94 (42%)	95 (42%)
CVP Ag	Contract Delivery	Long-Term	35	2 (3%)	1 (1%)	1 (2%)
		Dry and Critical	18	0 (2%)	-1 (-4%)	0 (0%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)						
CVP Refuge Level 2	Contract Delivery	Long-Term	15	-3 (-21%)	-3 (-21%)	-3 (-21%)
		Dry and Critical	14	-3 (-21%)	-3 (-21%)	-3 (-21%)
Refuge Level 4	Supply from acquisitions	Long-Term	12	0 (0%)	-5 (-42%)	-6 (-50%)
		Dry and Critical	11	5 (41%)	1 (11%)	2 (16%)
	Supply from NODOS	Long-Term	0	8	14	14
		Dry and Critical	0	4	7	7
CVP Ag	Contract Delivery (includes Cross Valley Canal)	Long-Term	600	12 (2%)	-4 (-1%)	6 (1%)
		Dry and Critical	307	0 (0%)	-17 (-6%)	-8 (-3%)
Total For All Regions						
Total CVP Supplies	Contract Delivery (Settlement, Ag, M&I and Refuges from CVP and NODOS – does not include Refuge Level 4 supply from acquisitions)	Long-Term	4,659	298 (6%)	288 (6%)	319 (7%)
		Dry and Critical	4,001	251 (6%)	222 (6%)	255 (6%)

Table 6-118
Annual CVP Deliveries (TAF)[a]
Alternatives A, B, and C Compared to Existing Conditions

Region and Delivery Type	Average (Annual)	EXC (TAF)	Change from Existing Conditions		
			Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

Ag = Agricultural
CVP = Central Valley Project
EXC = Existing Conditions
M&I = Municipal and Industrial
TAF = thousand acre-feet

Annual Long-Term Averages

Over the long-term averages, the total annual average CVP deliveries for all hydrologic regions show that increases of 288,000 to 319,000 acre-feet (six to seven percent) would occur for the three alternatives, when compared to Existing Conditions.

Over the long-term averages, the three alternatives show that increases in annual CVP M&I Service deliveries would occur in the Sacramento River and San Francisco Bay hydrologic regions.

Over the long-term averages, CVP M&I Service deliveries would increase substantially in the Sacramento River (by more than 125,000 acre-feet or 150 percent on average) and San Francisco Bay hydrologic regions (by 65,000 acre-feet or 29 percent on average) for the three alternatives, when compared to Existing Conditions. Average annual deliveries for CVP settlement contractors in the Sacramento River Hydrologic Region would increase from 31,000 to 35,000 acre-feet for the three alternatives, when compared to Existing Conditions.

Over the long-term averages, annual CVP Ag Service deliveries show that both positive and negative changes would occur in the four hydrologic regions for the three alternatives, when compared to Existing Conditions. The average annual deliveries for the CVP Exchange Contractors in the San Joaquin River Hydrologic Region would remain the same for the three alternatives, when compared to Existing Conditions.

If Alternative B is implemented, annual CVP Ag Service deliveries would decrease in the Sacramento River Hydrologic Region (by 7,000 acre-feet or three percent), in the San Joaquin River Hydrologic Region (by 1,000 acre-feet or less than one percent) and in the Tulare Lake Hydrologic Region (by 4,000 acre-feet or one percent).

If Alternatives A and C are implemented, annual CVP Ag Service deliveries would decrease in the Sacramento River Hydrologic Region (by 1,000 acre-feet) and San Joaquin River Hydrologic Region (by 7,000 and 4,000 acre-feet, or two and one percent, respectively).

Over the long-term averages, Wildlife Refuge Level 2 deliveries would increase (by 29,000 to 32,000 acre-feet or more than 20 percent) in the Sacramento River Hydrologic Region. However, Wildlife Refuge Level 2 deliveries would decrease in the San Joaquin River Hydrologic Region (by

20,000 acre-feet or seven percent) and in the Tulare Lake Hydrologic Region (by 3,000 acre-feet or 21 percent).

Over the long-term averages, Wildlife Refuge Level 4 supplies for Alternatives A, B, and C would increase, when compared to Existing Conditions. The Project would provide up to 2,000 acre-feet in the Sacramento River Hydrologic Region, up to 58,000 acre-feet in the San Joaquin River Hydrologic Region, and up to 14,000 acre-feet in the Tulare Lake Hydrologic Region. Water acquisitions to meet the Wildlife Refuge Level 4 supply goals would be reduced as the substitute supply from the Project becomes available, but total Wildlife Refuge Level 4 supplies would increase.

Annual Dry and Critical Years Averages

Over the Dry and Critical water years averages, the total annual average CVP deliveries for all hydrologic regions show that increases of 222,000 to 255,000 acre-feet (six to seven percent) would occur for the three alternatives, when compared to Existing Conditions.

Over the Dry and Critical water years averages, the three alternatives show that increases in annual CVP M&I Service deliveries would occur in the Sacramento River and San Francisco Bay hydrologic regions**.**

Over the Dry and Critical water years averages, CVP M&I Service deliveries would increase substantially in the Sacramento River (by more than 100,000 acre-feet or 135 percent on average) and San Francisco Bay hydrologic regions (by approximately 95,000 acre-feet or 42 percent on average) for the three alternatives. Over the Dry and Critical water years averages, annual CVP Ag Service deliveries show that positive and negative changes would occur in the four hydrologic regions for the three alternatives. CVP settlement contractors' deliveries in the Sacramento River Hydrologic Region would increase from 28,000 to 37,000 acre-feet for the three alternatives, when compared to Existing Conditions.

If Alternative B is implemented, annual Dry and Critical water years averages for CVP Ag Service deliveries would decrease in the San Francisco Bay Hydrologic Region (by 1,000 acre-feet or four percent) and in the Tulare Lake Hydrologic Region (by 17,000 acre-feet or six percent).

If Alternatives A, B, and C are implemented, annual Dry and Critical water years averages for CVP Ag Service deliveries would decrease in the Sacramento River Hydrologic Region (by 9,000 to 14,000 acre-feet or 8 to 13 percent) and San Joaquin River Hydrologic Region (by 1,000 to 9,000 acre-feet or one to six percent). Deliveries for the CVP Exchange Contractors in the San Joaquin River Hydrologic Region would remain the same for the three alternatives, when compared to Existing Conditions.

If Alternative C is implemented, annual Dry and Critical water years averages for CVP Ag Service deliveries would decrease in the Tulare Lake Hydrologic Region (by 8,000 acre-feet or three percent).

Over the Dry and Critical water years averages, Wildlife Refuge Level 2 deliveries would increase noticeably (by 25,000 to 27,000 acre-feet or more than 20 percent) in the Sacramento River Hydrologic Region. However, Wildlife Refuge Level 2 deliveries would decrease in the San Joaquin River Hydrologic Region (by 18,000 acre-feet or seven percent) and in the Tulare Lake Hydrologic Region (by 3,000 acre-feet or 21 percent).

Over the Dry and Critical water years averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would increase, when compared to Existing Conditions. The Project would provide up to 1,000 acre-feet in the Sacramento River Hydrologic Region, up to 30,000 acre-feet in the San Joaquin

River Hydrologic Region, and up to 7,000 acre-feet in the Tulare Lake Hydrologic Region. Water acquisitions to meet the Wildlife Refuge Level 4 supply goals would be reduced as the substitute supply from the Project becomes available.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-119 shows total annual CVP deliveries for Alternatives A, B, and C, when compared to the No Project/No Action Alternative for averages over the long term as well as Dry and Critical water years averages.

Table 6-119
Annual CVP Deliveries (TAF)[a]
Alternatives A, B and C Compared to the No Project/No Action Alternative

Region and Delivery Type		Average (Annual)	NPA/ NAA (TAF)	Change from No Project/No Action Alternative		
				Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
Sacramento River Hydrologic Region						
CVP Settlement	Contract Delivery	Long-Term[b]	1,934	9 (0%)	5 (0%)	8 (0%)
		Dry and Critical[c]	1,918	14 (1%)	5 (0%)	14 (1%)
CVP Refuge Level 2	Contract Delivery	Long-Term	155	4 (3%)	3 (2%)	6 (4%)
		Dry and Critical	137	4 (3%)	3 (2%)	5 (4%)
Refuge Level 4	Supply from acquisitions	Long-Term	27	-1 (-4%)	-1 (-4%)	-2 (-7%)
		Dry and Critical	25	0 (0%)	-1 (-2%)	-1 (-2%)
	Supply from NODOS	Long-Term	0	1 (0%)	1 (0%)	2 (0%)
		Dry and Critical	0	0 (0%)	1 (0%)	1 (0%)
CVP M&I	Contract Delivery	Long-Term	211	1 (1%)	0 (0%)	2 (1%)
		Dry and Critical	174	1 (0%)	1 (0%)	2 (1%)
CVP Ag	Contract Delivery (does not include Settlement contractors)	Long-Term	213	9 (5%)	3 (1%)	9 (5%)
		Dry and Critical	93	10 (11%)	5 (5%)	9 (10%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)						
CVP Exchange	Contract Delivery	Long-Term	852	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	814	0 (0%)	0 (0%)	0 (0%)
CVP Refuge Level 2	Contract Delivery	Long-Term	261	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	249	0 (0%)	0 (0%)	0 (0%)
Refuge Level 4	Supply from acquisitions	Long-Term	86	-34 (-40%)	-56 (-65%)	-58 (-67%)
		Dry and Critical	82	-17 (-21%)	-29 (-36%)	-29 (-36%)
	Supply from NODOS	Long-Term	0	35	56	58
		Dry and Critical	0	17	30	29
CVP M&I	Contract Delivery	Long-Term	16	0	0	0
		Dry and Critical	13	0	0	0
CVP Ag	Contract Delivery (does not include Exchange contractors)	Long-Term	290	6 (2%)	-2 (-1%)	3 (1%)
		Dry and Critical	137	10 (7%)	2 (1%)	6 (4%)
San Francisco Bay Hydrologic Region						
CVP M&I	Contract Delivery	Long-Term	290	1 (0%)	0 (0%)	1 (0%)
		Dry and Critical	318	1 (0%)	0 (0%)	1 (0%)
CVP Ag	Contract Delivery	Long-Term	36	1 (2%)	0 (0%)	0 (1%)
		Dry and Critical	17	1 (10%)	0 (0%)	1 (7%)

Table 6-119
Annual CVP Deliveries (TAF)[a]
Alternatives A, B and C Compared to the No Project/No Action Alternative

Region and Delivery Type		Average (Annual)	NPA/ NAA (TAF)	Change from No Project/No Action Alternative		
				Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)						
CVP Refuge Level 2	Contract Delivery	Long-Term	12	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	11	0 (0%)	0 (0%)	0 (0%)
Refuge Level 4	Supply from acquisitions	Long-Term	20	-8 (-40%)	-13 (-65%)	-14 (-70%)
		Dry and Critical	20	-4 (-20%)	-7 (-37%)	-7 (-34%)
	Supply from NODOS	Long-Term	0	8	14	14
		Dry and Critical	0	4	7	7
CVP Ag	Contract Delivery (includes Cross Valley Canal)	Long-Term	599	13 (2%)	-3 (-1%)	7 (1%)
		Dry and Critical	283	24 (9%)	7 (3%)	16 (6%)
Total For All Regions						
Total CVP Supplies	Contract Delivery (Settlement, Ag, M&I and Refuges from CVP and NODOS – does not include Refuge Level 4 supply from acquisitions)	Long-Term	4,868	89 (2%)	79 (2%)	110 (2%)
		Dry and Critical	4,164	88 (2%)	59 (1%)	92 (2%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.
[b]Long-Term is the average quantity for the period of October 1921 through September 2003.
[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:
Ag = Agricultural
CVP = Central Valley Project
M&I = Municipal and Industrial
NPA/NAA = No Project/No Action Alternative
TAF = thousand acre-feet

Annual Long-Term Averages

Over the long-term averages, the total annual CVP deliveries for all hydrologic regions show that increases of 79,000 to 110,000 acre-feet (two percent) would occur for the three alternatives, when compared to the No Project/No Action Alternative. Thus, implementation of Alternative A, B or C would result in a **potentially beneficial effect** to total annual CVP deliveries, when compared to the No Project/No Action Alternative**.**

Over the long-term averages, annual CVP M&I Service deliveries show that either no change or minor increases (at most 1 percent) would occur in the four hydrologic regions, when compared to the No Project/No Action Alternative.

Over the long-term averages, annual CVP Ag Service deliveries show that positive and negative changes would occur in the four hydrologic regions for the three alternatives, when compared to the No Project/No Action Alternative. Annual deliveries for the CVP settlement contractors in the Sacramento River Hydrologic Region for the three alternatives would increase slightly from 5,000 to 9,000 acre-feet, and annual deliveries for the CVP Exchange Contractors in the San Joaquin River Hydrologic Region for the three alternatives would remain the same, when compared to the No Project/No Action Alternative.

Over the long-term averages, CVP Ag Service deliveries would increase in the Sacramento River Hydrologic Region (by 3,000 to 9,000 acre-feet or one to five percent) for the three alternatives.

If Alternative B is implemented, annual CVP Ag Service deliveries would decrease in the San Joaquin River Hydrologic Region (by 2,000 acre-feet or one percent) and in the Tulare Lake Hydrologic Region (by 3,000 acre-feet or one percent[2]).

If Alternatives A and C are implemented, annual CVP Ag Service deliveries would increase in San Joaquin River Hydrologic Region (by 3,000 to 6,000 acre-feet or one to two percent), San Francisco Bay Hydrologic Region (by 1,000 acre-feet or two percent), and the Tulare Lake Hydrologic Region (by 7,000 to 13,000 acre-feet or one to two percent).

Over the long-term averages, Wildlife Refuge Level 2 deliveries would increase in only the Sacramento River Hydrologic Region (by 3,000 to 6,000 acre-feet or two to four percent) for the three alternatives.

Over the long-term averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would be the same, when compared to the No Project/No Action Alternative. The Project would provide up to 2,000 acre-feet in the Sacramento River Hydrologic Region, up to 58,000 acre-feet in the San Joaquin River Hydrologic Region, and up to 1,000 acre-feet in the Tulare Lake Hydrologic Region. Water acquisitions to meet the Wildlife Refuge Level 4 supply goals would be reduced as the substitute supply from the Project becomes available. The total Wildlife Refuge Level 4 supplies from both acquisitions and the Project would be the same as for the No Project/No Action Alternative.

Annual Dry and Critical Years Averages

Over the Dry and Critical water years averages, the total annual CVP deliveries for all hydrologic regions show that increases of 59,000 to 92,000 acre-feet (one to two percent) would occur for the three alternatives, when compared to the No Project/No Action Alternative. Thus, implementation of Alternative A, B, or C would result in a **potentially beneficial effect** to total annual CVP deliveries, when compared to the No Project/No Action Alternative.

Over the Dry and Critical water years averages, annual CVP M&I Service show either no change or minor increases (at most one percent) in the four hydrologic regions for the three alternatives, when compared to the No Project/No Action Alternative.

Over the Dry and Critical water years averages, annual CVP Ag Service deliveries show that either no change or noticeable increases would occur for the three alternatives, when compared to the No Project/No Action Alternative. Annual Dry and Critical water years averages for CVP settlement contractors deliveries in the Sacramento River Hydrologic Region for the three alternatives would increase slightly from 5,000 to 14,000 acre-feet, and annual Dry and Critical water years averages for the CVP Exchange Contractors deliveries in the San Joaquin River Hydrologic Region for the three alternatives would remain the same, when compared to the No Project/No Action Alternative.

If either Alternative A or C is implemented, annual Dry and Critical water years averages for CVP Ag Service deliveries would increase (by 45,000 acre-feet or nine percent for Alternative A and by 32,000 acre-feet or six percent for Alternative C) for the four hydrologic regions. If Alternative B is implemented, annual Ag Service deliveries would increase (by 14,000 acre-feet or three percent) in the Sacramento River, San Joaquin River, and Tulare Lake hydrologic regions.

[2] Table 6-119 shows a decrease of one percent due to rounding.

Over the Dry and Critical water years averages, annual Wildlife Refuge Level 2 deliveries would increase in only the Sacramento River Hydrologic Region (by 3,000 to 5,000 acre-feet or two to four percent) for the three alternatives, when compared to the No Project/No Action Alternative.

Over the Dry and Critical water years averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would be the same, when compared to No Project/No Action Alternative. The Project would provide up to 1,000 acre-feet in the Sacramento River Hydrologic Region, up to 30,000 acre-feet in the San Joaquin River Hydrologic Region, and up to 7,000 acre-feet in the Tulare Lake Hydrologic Region. Water acquisitions to meet the Wildlife Refuge Level 4 supply goals would be reduced as the substitute supply from the Project becomes available. The total Wildlife Refuge Level 4 supplies from both acquisitions and the Project would be the same as for the No Project/No Action Alternative.

SWP Contract Deliveries

Alternatives A, B, and C Compared to Existing Conditions

Table 6-120 shows total annual SWP deliveries for Alternatives A, B, and C and Existing Conditions for averages over the long term as well as Dry and Critical water years averages.

Table 6-120
Annual SWP Regional Deliveries (TAF)[a]
Alternatives A, B and C Compared to Existing Conditions

Region and Delivery Type		Average (Annual)	EXC (TAF)	Change from Existing Conditions		
				Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
Sacramento River Hydrologic Region						
SWP FRSA	Contract Delivery	Long-Term[b]	948	2 (0%)	2 (0%)	0 (0%)
		Dry and Critical[c]	899	2 (0%)	2 (0%)	-4 (0%)
SWP M&I	Contract Delivery	Long-Term	24	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	17	1 (9%)	1 (9%)	2 (12%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)						
SWP Ag	Contract Delivery (including Article 21)	Long-Term	4	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	3	0 (0%)	0 (0%)	0 (0%)
San Francisco Bay Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21, includes transfers to SWP contractors)	Long-Term	190	18 (9%)	19 (9%)	19 (10%)
Central Coast Hydrologic Region						
SWP M&I	Contract Delivery	Long-Term	45	1 (2%)	1 (2%)	1 (3%)
		Dry and Critical	35	1 (1%)	0 (0%)	1 (3%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)						
SWP M&I	Contract Delivery	Long-Term	87	1 (1%)	1 (1%)	2 (2%)
		Dry and Critical	62	6 (9%)	6 (9%)	8 (11%)
SWP Ag	Contract Delivery (including Article 21)	Long-Term	695	-6 (-1%)	-4 (-1%)	-2 (0%)
		Dry and Critical	492	26 (5%)	23 (5%)	34 (7%)
South Lahontan Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21)	Long-Term	261	19 (7%)	20 (8%)	20 (8%)
		Dry and Critical	220	7 (3%)	5 (2%)	10 (5%)

Table 6-120
Annual SWP Regional Deliveries (TAF)[a]
Alternatives A, B and C Compared to Existing Conditions

Region and Delivery Type		Average (Annual)	EXC (TAF)	Change from Existing Conditions: Alternative A (TAF/%)	Change from Existing Conditions: Alternative B (TAF/%)	Change from Existing Conditions: Alternative C (TAF/%)
South Coast Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21, includes transfers to SWP contractors)	Long-Term	1,305	110 (8%)	114 (9%)	116 (9%)
		Dry and Critical	1,047	85 (8%)	74 (7%)	98 (9%)
SWP Ag	Contract Delivery (including Article 21)	Long-Term	9	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	6	1 (9%)	0 (0%)	1 (10%)
Total For All Regions						
Total SWP Supplies	Contract Delivery (FRSA, Ag, and M&I from SWP and NODOS)	Long-Term	3,568	144 (4%)	152 (4%)	156 (4%)
		Dry and Critical	2,938	131 (4%)	114 (4%)	155 (5%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

Ag = Agricultural
EXC = Existing Conditions
FRSA = Feather River Service Area
M&I = Municipal and Industrial
SWP = State Water Project
TAF = thousand acre-feet

Annual Long-Term Averages

Over the long-term averages, total annual deliveries to all hydrologic regions show that an increase of 144,000 to 156,000 acre-feet (four to five percent) would occur, when compared to Existing Conditions for the three alternatives. Alternatives B and C, with the larger 1.81-MAF reservoir size, would show annual delivery increases that are larger than those for Alternative A.

Over the long-term averages, substantial annual M&I Service delivery increases would be in the San Francisco Bay (by 18,000 to 19,000 acre-feet or 9 to 10 percent), South Lahontan (by 19,000 to 20,000 acre-feet or seven to eight percent), and South Coast hydrologic regions (by 110,000 to 116,000 acre-feet or eight to nine percent), when compared to Existing Conditions for the three alternatives.

Over the long-term averages, annual Ag Service deliveries show that no change would occur, except for decreases in the Tulare Lake Hydrologic Region with implementation of Alternative A (by 6,000 acre-feet or one percent) and Alternative B (by 4,000 acre-feet or one percent).

Annual Dry and Critical Years Averages

Over the Dry and Critical water years averages, total deliveries for all hydrologic regions show that an increase of 114,000 to 155,000 acre-feet (four to five percent) would occur, when compared to Existing Conditions for the three alternatives. Both Alternative A and C, which include the Delevan Pipeline Intake Facilities (diversion and release conveyance), have larger total annual delivery increases despite the reservoir size difference, when compared to Alternative B, which includes the release-only Delevan Pipeline Discharge Facility.

Over the Dry and Critical water years averages, substantial annual M&I Service delivery increases would be in the South Coast (by 74,000 to 98,000 acre-feet or seven to nine percent), Tulare Lake (by 6,000 to 8,000 acre-feet or 9 to 11 percent), and South Lahontan (by 5,000 to 10,000 acre-feet or two to five percent) hydrologic regions.

Over the Dry and Critical water years averages, the Tulare Lake Hydrologic Region shows that a large change in Ag Service deliveries would occur (by 23,000 to 34,000 acre-feet or five to seven percent), where current Ag Service deliveries are fairly substantial (492,000 acre-feet per year for Existing Conditions) in that region.

Alternatives A, B, and C Compared to the No Project/No Action Alternative

Table 6-121 shows total annual SWP deliveries for Alternatives A, B, and C and the No Project/No Action Alternative for averages over the long-term as well as Dry and Critical water years averages.

Table 6-121
Annual SWP Regional Deliveries (TAF)[a]
Alternatives A, B and C Compared to the No Project/No Action Alternative

Region and Delivery Type		Average (Annual)	NPA/ NAA (TAF)	Change from No Project/No Action Alternative		
				Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
Sacramento River Hydrologic Region						
SWP FRSA	Contract Delivery	Long-Term[b]	950	0 (0%)	0 (0%)	-2 (0%)
		Dry and Critical[c]	901	0 (0%)	0 (0%)	-6 (-1%)
SWP M&I	Contract Delivery	Long-Term	23	1 (6%)	1 (6%)	1 (7%)
		Dry and Critical	16	2 (16%)	2 (15%)	3 (19%)
San Joaquin River Hydrologic Region (not including Friant-Kern and Madera Canal water users)						
SWP Ag	Contract Delivery (including Article 21)	Long-Term	4	0 (0%)	0 (0%)	0 (0%)
		Dry and Critical	3	0 (0%)	0 (0%)	0 (0%)
San Francisco Bay Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21, includes transfers to SWP contractors)	Long-Term	199	9 (5%)	10 (5%)	10 (5%)
		Dry and Critical	142	18 (13%)	17 (12%)	21 (15%)
Central Coast Hydrologic Region						
SWP M&I	Contract Delivery	Long-Term	44	2 (5%)	2 (5%)	2 (5%)
		Dry and Critical	31	5 (14%)	4 (14%)	5 (17%)
Tulare Lake Hydrologic Region (not including Friant-Kern Canal water users)						
SWP M&I	Contract Delivery	Long-Term	84	4 (5%)	4 (5%)	5 (5%)
		Dry and Critical	60	8 (14%)	8 (14%)	10 (17%)
SWP Ag	Contract Delivery (including Article 21)	Long-Term	658	31 (5%)	33 (5%)	35 (5%)
		Dry and Critical	460	58 (13%)	55 (12%)	66 (14%)
South Lahontan Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21)	Long-Term	267	13 (5%)	14 (5%)	14 (5%)
		Dry and Critical	197	30 (15%)	28 (14%)	33 (17%)
South Coast Hydrologic Region						
SWP M&I	Contract Delivery (including Article 21, includes transfers to	Long-Term	1,353	62 (5%)	66 (5%)	68 (5%)
		Dry and Critical	990	142 (14%)	131 (13%)	155 (16%)

Table 6-121
Annual SWP Regional Deliveries (TAF)[a]
Alternatives A, B and C Compared to the No Project/No Action Alternative

Region and Delivery Type		Average (Annual)	NPA/ NAA (TAF)	Change from No Project/No Action Alternative: Alternative A (TAF/%)	Alternative B (TAF/%)	Alternative C (TAF/%)
	SWP contractors)					
SWP Ag	Contract Delivery (including Article 21)	Long-Term	8	1 (5%)	1 (5%)	1 (5%)
		Dry and Critical	6	1 (13%)	0 (0%)	1 (14%)
Total For All Regions						
Total SWP Supplies	Contract Delivery (FRSA, Ag, and M&I from SWP and NODOS)	Long-Term	3,589	123 (3%)	131 (4%)	135 (4%)
		Dry and Critical	2,804	265 (9%)	248 (9%)	289 (10%)

[a]Based on CALSIM-II modeling over an 82-year simulation period.

[b]Long-Term is the average quantity for the period of October 1921 through September 2003.

[c]Dry and Critical Years Average is the average quantity for the combination of the SWRCB D-1641 40-30-30 Dry and Critical years for the period of October 1921 through September 2003.

Notes:

Ag = Agricultural
FRSA = Feather River Service Area
M&I = Municipal and Industrial
NPA/NAA =No Project/ No Action Alternative
SWP = State Water Project
TAF = thousand acre-feet

Annual Long-Term Averages

Over the long-term averages, total annual SWP deliveries for all hydrologic regions show that an increase of 123,000 to 135,000 acre-feet (three to four percent) would occur, when compared to the No Project/No Action Alternative for the three alternatives. Because the three alternatives show that increases in total annual SWP deliveries over the long-term averages would occur, implementation of Alternative A, B, or C would result in a **potentially beneficial effect** to total annual SWP deliveries, when compared to the No Project/No Action Alternative.

Deliveries by hydrologic region show that uniform increases would occur, when compared to the No Project/No Action Alternative for the three alternatives.

Over the long-term averages, annual M&I Service deliveries would increase in the San Francisco Bay (by 9,000 to 10,000 acre-feet or five percent), South Lahontan (by 13,000 to 14,000 acre-feet or five percent), and South Coast hydrologic regions (by 62,000 to 68,000 acre-feet or five percent), for the three alternatives, when compared to the No Project/No Action Alternative.

Over the long-term averages, annual Ag Service deliveries show either no change or an increase would occur to all hydrologic regions for the three alternatives, when compared to the No Project/No Action Alternative. Tulare Lake Hydrologic Region shows the largest Ag Service increase (by 31,000 to 35,000 acre-feet or five percent).

Annual Dry and Critical Years Averages

Over the Dry and Critical water years averages, the total annual SWP deliveries to all hydrologic regions show that an increase of 248,000 to 289,000 acre-feet (9 to 10 percent) would occur, when compared to the No Project/No Action Alternative for the three alternatives.

Because the three alternatives show that increases in total annual SWP deliveries over the Dry and Critical water years averages would occur**,** implementation of Alternative A, B, or C would result in a **potentially beneficial effect** to total annual SWP deliveries, when compared to the No Project/No Action Alternative.

Over the Dry and Critical water years averages, annual deliveries by hydrologic region show that greater increases for M&I and Ag Service deliveries would occur, when compared to the No Project/No Action Alternative for the three alternatives.

Over the Dry and Critical water years averages, annual M&I Service deliveries would increase in all hydrologic regions, with an increase in the San Francisco Bay (by 17,000 to 21,000 acre-feet or 12 to 15 percent), South Lahontan (by 28,000 to 33,000 acre-feet or 14 to 17 percent), and South Coast hydrologic regions (by 131,000 to 155,000 acre-feet or 13 to 16 percent), when compared to the No Project/No Action Alternative for the three alternatives.

Over the Dry and Critical water years averages, annual Ag Service would increase, with the largest increase in the Tulare Lake Hydrologic Region (by 55,000 to 66,000 acre-feet or 12 to 14 percent), when compared to the No Project/No Action Alternative for the three alternatives.

If Alternative C is implemented, FRSA deliveries show that a 6,000 acre-feet decrease (one percent[3]) would occur.

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[3] Table 6-121 shows a decrease of one percent due to rounding.

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Figures

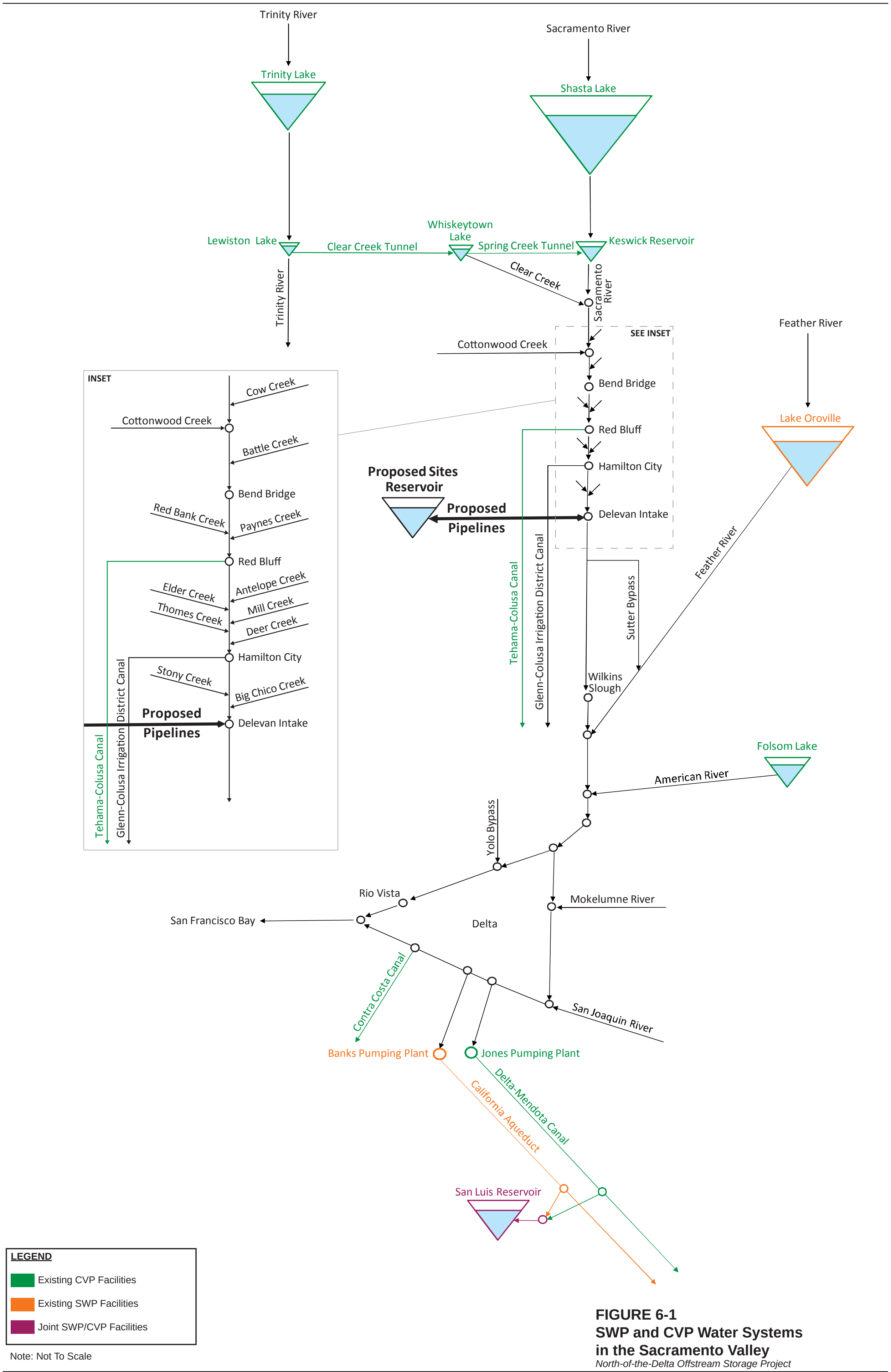

FIGURE 6-1
SWP and CVP Water Systems in the Sacramento Valley
North-of-the-Delta Offstream Storage Project

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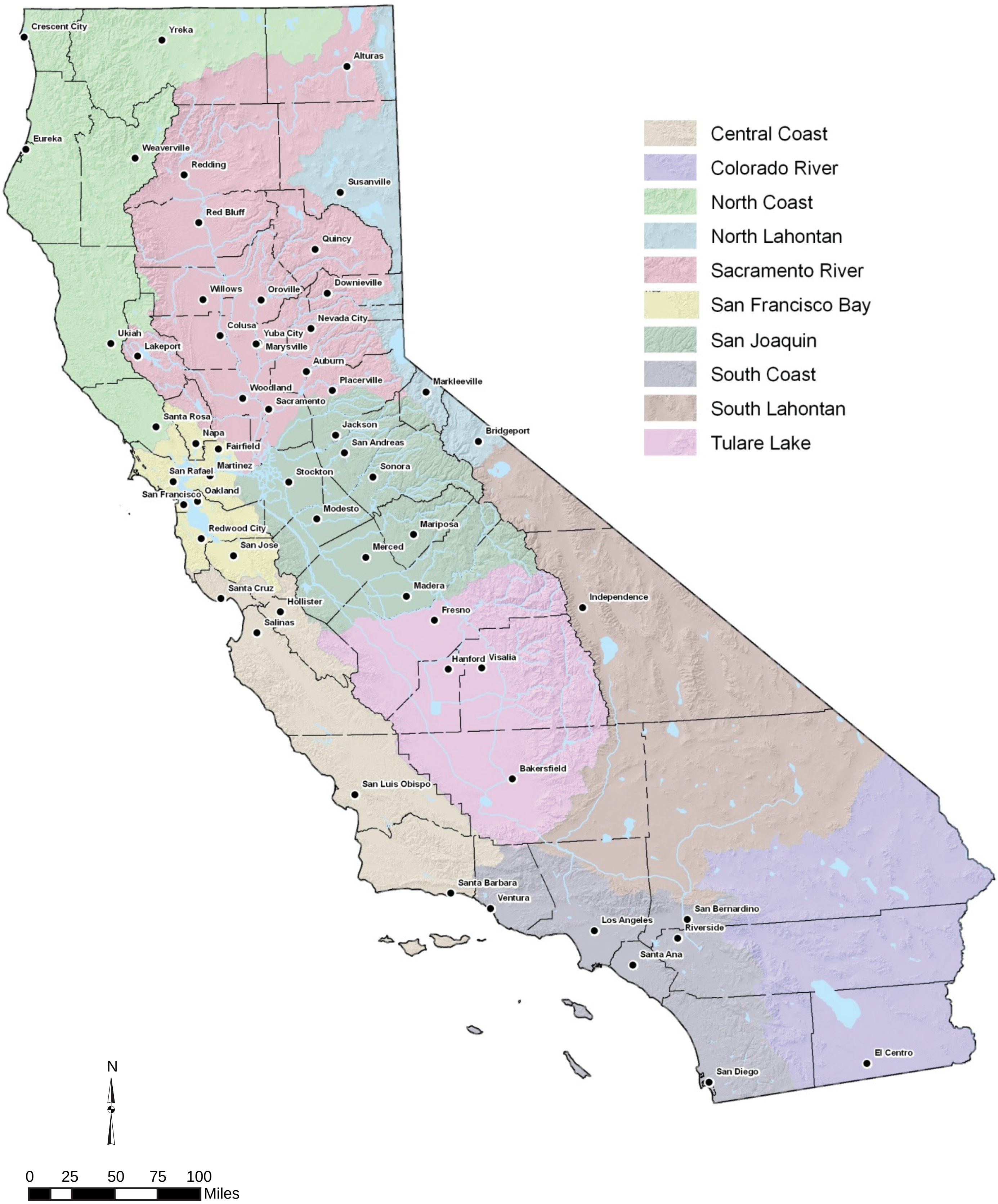

FIGURE 6-2
Hydrologic Regions in California
North-of-the-Delta Offstream Storage Project

7. Surface Water Quality

7.1 Introduction

This chapter describes the existing surface water quality of reservoirs and rivers for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Water quality can be affected by point and non-point discharges of contaminants, as well as physical and chemical changes within the water column caused by environmental and biological processes.

The regulatory setting for water quality is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary and Secondary study areas. Potential impacts in the Extended Study Area were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

7.2 Affected Environment

7.2.1 Extended Study Area

Water quality in the Extended Study Area varies regionally due to differences in land use practices, geology, source water, and climate. Agricultural water quality issues include the urban development of agricultural land due to the increasing human population in the State. Agricultural return flows to natural waters also affect water quality in terms of various contaminants, including pesticides, increased water temperatures and depressed dissolved oxygen levels, increased salinity and nutrient loads, and sedimentation and groundwater overdraft due to reductions in surface water deliveries. These agricultural return flows contribute to wildlife refuge water supply. Municipal and industrial water quality is directly related to population levels. Increased urban development arising from increasing populations also increases the need for infrastructure to treat drinking water supplies as well as wastewater. Most large wastewater treatment plants are required to perform tertiary treatment before recycling wastewater for urban landscape irrigation, as a means to increase limited drinking water supplies. Urban stormwater discharges have been shown to have an impact to receiving waters through increased nutrient loads, pesticides, and trash.

For planning purposes, California is divided into 10 hydrologic regions corresponding to the State's major water drainage basins (DWR, 2005a). The CVP and SWP service areas of the Extended Study Area are located within nine of California's 10 hydrologic regions. San Luis Reservoir is located within the San Joaquin River Hydrologic Region. The nine hydrologic regions are described below:

- **North Coast:** Klamath River and Lost River basins, and all basins draining into the Pacific Ocean from Oregon south through the Russian River Basin.
- **San Francisco Bay:** Basins draining into San Francisco, San Pablo, and Suisun bays, and into the Sacramento River downstream from Collinsville; western Contra Costa County; and basins directly

tributary to the Pacific Ocean downstream from the Russian River watershed to the southern boundary of the Pescadero Creek Basin.

- **Central Coast:** Basins draining into the Pacific Ocean downstream from the Pescadero Creek watershed to the southeastern boundary of Rincon Creek Basin in western Ventura County.
- **South Coast:** Basins draining into the Pacific Ocean from the southeastern boundary of Rincon Creek Basin to the international border with Mexico.
- **Sacramento River:** Basins draining into the Sacramento River system in the Central Valley (including the Pit River drainage), from the Oregon border south through the American River drainage basin.
- **San Joaquin River:** Basins draining into the San Joaquin River system, from the Cosumnes River basin on the north through the southern boundary of the San Joaquin River watershed.
- **Tulare Lake:** The closed drainage basin at the south end of the San Joaquin Valley, south of the San Joaquin River watershed, encompassing basins draining to Kern Lakebed, Tulare Lakebed, and Buena Vista Lakebed.
- **South Lahontan:** The interior drainage basins east of the Sierra Nevada crest, south of the Walker River watershed, northeast of the Transverse Ranges, and north of the Colorado River Region. The main basins are the Owens and the Mojave River basins.
- **Colorado River:** Basins south and east of the South Coast and South Lahontan regions; areas that drain into the Colorado River, Salton Sea, and other closed basins north of the border with Mexico.

The following discussions summarize surface water quality conditions for these hydrologic regions, and describe their relationships with the other hydrologic regions.

7.2.1.1 *North Coast Hydrologic Region*

The North Coast Hydrologic Region faces many water quality and water supply challenges. The North Coast Regional Water Quality Control Board's (North Coast RWQCB) water quality priorities highlight the need for control of nonpoint source runoff from logging, rural roads, agriculture, and urban areas (DWR, 2005b). Sediment, temperature, and nutrients are the primary focus of the RWQCB's 303(d) list of impaired water bodies. Along the coast, nonpoint-source pollution can cause microbial contamination of shellfish growing areas, especially oysters. Much of the region is characterized by rugged, steep, forested lands, with highly erodible, loosely consolidated soils; these conditions, combined with wildfires, extensive timber harvesting, and heavy precipitation primarily in the form of rain, make the watershed highly susceptible to erosion and landslides. Heavy runoff, in turn, causes stream sedimentation that adversely impacts habitat for spawning and rearing anadromous fish. Channel modifications and water diversions have radically changed water quality conditions in many waterbodies in the region by reducing natural flows that dilute contaminant concentrations and lessen their impacts. In the southern portion of the region, the development of new hillside vineyards is an increasing source of erosion and pesticides.

Fisheries can be adversely affected by a number of factors related to both water quality and water quantity. The Eel, Mad, Trinity, Klamath and Russian rivers, as well as many other streams, suffer from sedimentation, which can smother salmonid spawning areas. The *Water Quality Control Plan for the North Coast Region* (North Coast Basin Plan) sets turbidity (a measure of water clarity) restrictions to control erosion impacts from logging and related activities, such as road building (NCRWQCB, 2011).

Timber harvests can also decrease the canopy shading rivers and streams, thereby increasing water temperatures to levels that are detrimental to cold water fisheries.

The North Coast Basin Plan specifically establishes temperature objectives for the Trinity River, in which reduced flows have disrupted temperature and physical cues for anadromous fish runs. Because of water diversions, summer temperatures in the Trinity River as well as the Klamath River can be lethal to salmonids. Fisheries can be further affected by the lack of woody debris for pool habitat and sediment metering.

The North Coast Basin Plan requires tertiary, or three-phase, treatment of wastewater discharges to the Russian River, which is a major source of domestic water, and establishes limits on bacteriological contamination of shellfish-growing areas along the coast. The plan also prohibits or strictly limits waste discharges to the Klamath, Trinity, Smith, Mad, and Eel rivers, as well as estuaries and other coastal waters. Nonpoint source runoff, especially after heavy precipitation, has resulted in contamination and closure of shellfish harvesting beds in Humboldt Bay.

Other water quality concerns include the impacts of boating fuel constituents, such as methyl tertiary-butyl ether (MTBE) to recreational water use at Trinity, Lewiston, and Ruth lakes. Abandoned mines, forest herbicide application, and historical discharge of wood treatment chemicals at lumber mills, including from the Trinity River Lumber Company in Weaverville, also are regional issues of concern.

Relationship with Other Regions

The Klamath River Basin straddles the Oregon border, such that water from the upper basin flows into Oregon and eventually returns to California upstream from Iron Gate Reservoir. On the Oregon side of this interstate basin, two surface water diversions export an average of 29,600 acre-feet per year from Klamath River tributaries into the Rogue River system in Oregon. The Klamath River Basin also receives a small amount of imported water (approximately 2,000 acre-feet per year) from the upper reaches of the Sacramento River Hydrologic Region through a canal (the North Fork Ditch).

The North Coast Hydrologic Region exports a large volume of water from the upper reaches of the Trinity River into the Sacramento River Region through Reclamation's Lewiston Dam and the Clear Creek Tunnel. For 1998, 2000, and 2001, the Trinity River exports were 851,000 acre-feet per year, 1.11 million acre-feet per year, and 669,000 acre-feet per year, respectively (DWR, 2005b). In future years, these Trinity River exports are likely to be reduced due to the increased instream flows established for the Trinity River fishery.

7.2.1.2 *San Francisco Bay Hydrologic Region*

The San Francisco Bay Hydrologic Region is centered on the San Francisco Bay/Delta Estuary and its water quality (DWR, 2005c). The estuary's immediate watershed is highly urbanized, resulting in contaminant loads from point and nonpoint sources, as well as pollutants from the Napa, Petaluma, and Guadalupe rivers, the Sacramento-San Joaquin Delta, and the Central Valley. San Francisco Bay Area residents generally receive good quality drinking water that varies by source and treatment. Sources range from the Hetch Hetchy Reservoir and Mokelumne River, to local surface and groundwater and variable quality Delta water. Utilities that depend on the Delta for all or part of their domestic water supplies meet the current drinking water standards, although they remain concerned about issues, such as microbial contamination, salinity, and organic carbon.

Water and sediment in the estuary meet quality guidelines for most contaminants, with constituents in water meeting toxicity and chemical guidelines approximately 87 percent of the time. Sediment concentrations are more problematic due to legacy pollutants[1], with only approximately 60 percent of the sediment samples meeting chemical guidelines and passing toxicity tests. Estuary water quality has significantly improved since these chemicals have been prohibited, with fewer toxic episodes and decreased silver concentrations in the South Bay. Implementation of secondary, or two-phase, treatment of domestic wastewater has dramatically improved the quality of the San Francisco Estuary, especially the oxygen content, as has the reduction in the use of organophosphate pesticides.

Major water quality issues include control of stormwater, urban, and construction site runoff, as well as runoff and discharges from the vast Central Valley and Delta watershed. Legacy pollutants, such as PCBs and mercury, contaminate fish in the estuary. Other water quality concerns include copper and nickel in the South Bay, selenium from Contra Costa refineries, erosion from vineyards in Napa and Sonoma valleys, pesticides in urban creeks, and toxicity of water and sediment. Exotic and invasive species, such as the Chinese mitten crab and Asian clam, threaten to undermine the estuary's planktonic food web base, thus potentially altering its ecosystem (including native species). Because San Francisco Bay has several active seaports, discharge of ballast water and vessel wastes and maintenance dredging and disposal of contaminated sediments are water quality concerns. New contaminants are emerging that may be causing impacts to the aquatic ecosystem, including polybrominated diphenyl ethers (PBDEs), pyrethroid insecticides, and compounds from pharmaceuticals and personal care products.

The bay acts as a sediment repository, so persistent sediment-bound contaminants, such as mercury, dioxins, PCBs, and organochlorine pesticides have accumulated over time. These compounds also bioaccumulate[2] in the food chain, causing contamination of bay fish and endangering their consumers, including humans and wildlife. New inputs of the persistent sediment contaminants in the estuary are now controlled because the use of most organochlorine pesticides and PCBs are banned, and the concentrations in the sediments and in organisms appear to be declining. The San Francisco RWQCB is developing new regulatory requirements to address the mercury sources to the estuary, including the New Almaden mine, located in the vicinity of San Jose, and thousands of other abandoned mercury and gold mine tailings in the Central Valley watershed. Mercury contamination in estuary fish, such as the striped bass, has remained high for more than 30 years. Wetland restoration could increase mercury methylation[3] processes and cause higher contamination in fish. State and federal agencies, working through the CALFED Bay Delta Program and other organizations, have funded several studies to determine potential effects of restoration and explore management actions that would decrease methylmercury[4] production and bioaccumulation.

Relationship with Other Regions

The combined flows of the Sacramento and San Joaquin river watersheds flow through the Delta and into the San Francisco Bay. Delta outflow interacts with tides to determine how far salt water intrudes from the

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[1] Legacy pollutants, which include certain heavy metals, dichloro-diphenyl-trichloroethane (DDT), and polychlorinated biphenyls (PCBs), are persistent organic pollutants that are now banned, but were used in the past and persist in the environment long after they were first introduced.

[2] The gradual build-up of toxins in an organism at levels higher than those that occur in the surrounding environment.

[3] The conversion of inorganic mercury by microorganisms in soil and sediments (in air or water) to organic methylmercury.

[4] An organic form of mercury. It is a neurotoxin that is especially dangerous to fetuses and infants, attacking the central nervous system and causing an array of developmental and other problems. Methylmercury contamination and exposure can also adversely affect reproductive success and health of fish and other species.

ocean into the San Francisco Bay Estuary. The resulting salinity gradients influence the distribution of many estuarine fishes and invertebrates as well as plants, birds, and animals in wetlands areas. Delta outflow varies with hydrology, reservoir releases, and diversions upstream. Some surface water supplies that originate in the San Joaquin Hydrologic Region are diverted across the valley to the San Francisco Bay Hydrologic Region via the Mokelumne Aqueduct, which is operated by the East Bay Municipal Utility District. Surface water is also diverted through the Hetch Hetchy Aqueduct, which is owned and operated by the City of San Francisco. The average annual diversions made by these two projects from the Mokelumne and Tuolumne rivers are approximately 245,000 acre-feet per year through the Mokelumne Aqueduct, and 267,000 acre-feet per year through the Hetch-Hetchy Aqueduct (DWR, 2005c).

7.2.1.3 *Central Coast Hydrologic Region*

The Central Coast's limited surface water supply and few large surface water storage facilities, combined with the growing demand for water, is resulting in more dependence on groundwater (DWR, 2005d). Unique coastal resources, such as Morro Bay and Monterey Bay, as well as the Salinas Valley, are the focus of water quality issues. Sedimentation poses the greatest water quality threat to Morro Bay, one of 28 estuaries in the National Estuary Program. The bay is also contaminated by pathogens from agriculture, boats, and urban runoff; nutrients from fertilizers, animal wastes, and urban runoff; heavy metals from abandoned mines in the upper watershed; and sediment from offshore boatyards. Elevated levels of bacteria have closed many of the shellfish-growing beds in Morro Bay, and have occasionally closed beaches in Santa Cruz County and southern Santa Barbara County. To protect special areas of biological significance, waste discharges are prohibited or limited in portions of Monterey Bay, a National Marine Sanctuary, and other specific coastal and ocean waters of the region. In its 2005 Triennial Review, the Central Coast RWQCB also identified the need to incorporate new microbiological standards for water-contact recreation in this region.

The Salinas River watershed has significant nitrate contamination related to agriculture, which is the valley's main land use. The nearby Pajaro River watershed faces a variety of water quality threats, such as erosion (primarily from agricultural practices), urban runoff, sand and gravel mining, flood control projects, off-road vehicles, and historical mercury mining in the Hernandez Lake area.

Relationship with Other Regions

Historically, the communities of the Central Coast Hydrologic Region have relied on local surface water and groundwater supplies to meet their needs. The northern part of the region first received imported water with completion of the San Felipe Unit of the CVP in 1987. This facility delivers water to San Benito County users primarily for agricultural purposes from San Luis Reservoir in the San Joaquin River Hydrologic Region. Ten years later, the Coastal Branch of the SWP was completed to import water to San Luis Obispo and Santa Barbara counties from the California Aqueduct in the Tulare Lake Hydrologic Region. There are no other water imports into the Central Coast region. Because there is seldom any excess surface water in this region's watersheds, there are no water exports from this region to other parts of the State.

7.2.1.4 *South Coast Hydrologic Region*

Similar to many regions in the State, water quality and water supply challenges are intertwined. The South Coast region must manage for uncertainties caused by population and economic growth (DWR, 2005e). Growth will not only affect demand, but it will add contamination challenges from increases in wastewater discharges and urban runoff, as well as increased demand for water-based recreation. Outside of the region, environmental and water quality needs in the Delta and Owens River/Mono Basin systems affect imported water supply reliability and quality. The region must also assess and plan for impacts of climate variations and global climate change, as well as the cost of replacing aging infrastructure.

Given the size of the region and the diverse sources of water supply, the challenges to the region's water quality are varied. Surface water quality issues in the South Coast are dominated by stormwater and urban runoff, which contribute contaminants (including trash) to local creeks and rivers. These pollutant sources, as well as sanitary sewer overflows, ocean outfalls, tidal input, and even wildlife, can degrade coastal water quality, closing beaches and increasing the health risks from swimming. These sources also specifically affect water quality in the major bays: Santa Monica, Newport, and San Diego. Newport Bay, for instance, suffers from algal blooms (due to excess nutrients), toxicity to aquatic life, high bacterial counts, and sedimentation. Shipping can also influence water quality, especially at the U.S. Navy base in San Diego Bay and the Long Beach and Los Angeles harbors, where there are toxic sediment hot spots. Harbors, marinas, and recreational boating threaten water quality via ballast water discharges, which can introduce petroleum and sewage discharges and spills, biocides from boat hulls, boat cleaning and fish wastes, trash, and reduced water circulation. Constructed wetland projects in Hemet/San Jacinto, San Diego Creek, and Prado Basin remove large loads of nitrogen from wastewater and urban runoff. Salinity, nitrogen, and microbes are the major contaminants in the Santa Ana River, affecting downstream beneficial uses such as swimming and groundwater recharge for domestic use. Because of upstream irrigation diversions, flows in the middle and lower Santa Ana River are composed mostly of recycled water, creating a year-round flow that is high in salinity.

Lake Elsinore, the largest natural freshwater lake in southern California, experiences nuisance algae blooms from excess nutrients, impairing its ecological and recreational beneficial uses. Local groups have implemented many wetland and river restoration projects to improve water quality, including at Bolsa Chica, in Ballona Creek, and along the Los Angeles and San Gabriel rivers. The United States and Mexico jointly built the International Wastewater Treatment Plant to treat a portion of the sewage from Tijuana, which flows across the international boundary into the San Diego Basin.

The Chino Basin hosts the highest concentration of dairy animals in the U.S. In a 40-square-mile area, over 300,000 animals are maintained on approximately 300 dairies (DWR, 2005e). Because of a lack of sufficient land for manure disposal, as well as flooding from expanding suburban development, dairy runoff contributes nitrate, salts, and microorganisms to groundwater as well as surface water. Since 1972, the Santa Ana RWQCB has issued waste discharge requirements to the dairies in this basin. In addition, pilot projects to develop sewer systems for dairies and for treating dairy wash water have also recently been completed.

Public health and environmental and economic concerns have grown with the expansion of water recycling programs in the South Coast region. Some concerns are related to the total dissolved solids (TDS) content of wastewater and the presence in treated wastewater of pharmaceuticals, household products, and other emerging contaminants. The high salinity of imported Colorado River water limits the number of times water can be reused before the salt content becomes too high, and wastewater can only be discharged to the ocean. Increased use of recycled water and marginal quality groundwater supplies during droughts can result in water quality problems for some local supplies that endanger future water management projects. For instance, groundwater recharge potential may be restricted because the RWQCB has established TDS requirements for recharge water in some groundwater basins to protect existing basin water quality.

The average TDS concentration of the Mohave Water District's Colorado River Aqueduct water is approximately 600 to 700 mg/L, and the average TDS content of SWP water supply is approximately 300 mg/L. The water supply from the Los Angeles Aqueduct has a significantly lower TDS concentration, typically approximately 160 mg/L (DWR, 2005e).

In addition to salinity, several established and emerging contaminants of concern to the region's drinking water supplies include disinfection byproducts (DBPs), perchlorate, arsenic, nitrosodimethylamine (NDMA), hexavalent chromium, and MTBE. Imported water from the Owens Valley is of excellent water quality, and imported Delta water quality is generally good. Nonetheless, arsenic is a concern in the Owens Valley supply, and Delta water can contain precursors (such as organic carbon and bromide) of potentially carcinogenic DBPs, if treated with certain disinfection processes necessary to inactivate pathogens in drinking water.

Relationship with Other Regions

The South Coast Hydrologic Region imports water from three primary regions including SWP deliveries from the Sacramento River and San Joaquin River hydrologic regions; Owens Valley Aqueduct deliveries from the South Lahontan Hydrologic Region; and deliveries from the Colorado River Hydrologic Region.

7.2.1.5 *Sacramento River Hydrologic Region*

Surface water quality in the Sacramento River watershed is relatively good, when compared with statewide data, making the Sacramento River one of the most desirable water sources in the State (DWR, 2005f).

Nonetheless, increased turbidity, rice pesticides, and organophosphate pesticides, such as diazinon, affect fisheries and drinking water supplies. The decline of fisheries in the Sacramento River is, in part, related to water quality problems on the river's mainstem. Those water quality problems include unsuitable water temperature, toxic heavy metals, such as mercury, copper, zinc, and cadmium from acid mine drainage; and pesticides and fertilizer in agricultural runoff. Holding of rice field drainage, which allows for degradation of rice herbicides by re-flooding after harvest, has effectively addressed this water quality concern among downstream water users. In the Cache Creek watershed, Clear Lake suffers from large mercury, sediment, and nutrient loadings, the latter leading to nuisance algal blooms. Along with a few select other waterbodies, the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (Central Valley Basin Plan) (CVRWQCB, 2011) specifically prohibits direct discharges of wastes into Folsom Lake and the lower American River downstream to its confluence with the Sacramento River; waste discharges from houseboats on Shasta, Clear Lake, and in the Delta are also banned. High density recreation use of Whiskeytown and Shasta lakes may be contributing to high bacteria levels in these two reservoirs.

An evaluation of the strength of relationships between human activity (as indicated by landcover) and pollutant concentrations in recently deposited (2008) stream sediment indicates that the majority of sample sites in the Sacramento River watershed are in the lowest quartile for the range of concentrations for the metals cadmium, copper, lead, and zinc, with sites near Redding and Woodland in the second quartile (SWRCB, 2012a). These second quartile site results are related to the major point sources for metals discharging from Iron Mountain Mine (Redding area) and Cache Creek (Woodland area). Quartile cutoffs are at 25 percent, 50 percent, and 75 percent of the maximum measured concentrations.

Adverse effects from these constituents on sediment-dwelling organisms are not expected to occur below a threshold effects concentration (TEC), while adverse effects are expected to occur frequently above a probable effects concentration (PEC) (MacDonald et al. 2000, as cited in SWRCB, 2008). At concentrations between a TEC and PEC, it is difficult to predict whether or not the sediments would be toxic to organisms. Total mercury in unsieved sediment samples were found to be below the threshold effects concentration (TEC) for the majority of sample sites in the watershed, with sites near Redding and Woodland falling between the TEC and PEC.

For the legacy pollutant PCB, results were below the laboratory detection limit for all but one site, which was below the TEC. Results for total DDT, another legacy pollutant, were mostly below the TEC, with two sites between the TEC and PEC (SWRCB, 2012a).

Pyrethroid pesticides were either ‘non-detect’ or in the lowest quartile in the watershed. The higher pyrethroid levels were associated with the larger urban areas within the watershed (SWRCB, 2012a).

Sediment toxicity observed in the watershed was determined to be not significantly toxic, with the exception of the sample site in the Redding area and the associated Iron Mountain Mine acid mine drainage (SWRCB, 2012a).

Mercury contamination is significant throughout the State. In its 2005 Triennial Review, the Central Valley RWQCB identified mercury loads, a legacy of California’s gold mining heritage, as one of the most significant water quality problems in the region (SWRCB, 2012a). The Sacramento River watershed is the major source of total mercury to the Delta, contributing approximately 90 percent of the total mercury loads (SRWP, 2004). In particular, the Cache Creek watershed is the major source of mercury to the Delta; to a lesser extent, mercury is also a concern in Lake Berryessa and Marsh Creek Reservoir. Major sources of total mercury loads to the Sacramento River watershed include runoff and erosion from historic gold mining sites, erosion of native soils, and natural mineral springs. Minor mercury sources include treated wastewater, urban runoff, historic mercury mines, and atmospheric mercury deposition from external sources (SRWP, 2004). Because of methylmercury’s bioaccumulative properties, several waterbodies in the Sacramento River region have fish consumption advisories. Pesticide management and agricultural water discharge have received increased attention by the Central Valley RWQCB, which made the decision to eliminate waivers associated with agricultural discharge in 2003. Coalitions in the region are forming partnerships to address this issue through a watershed approach, as provided for by the Central Valley RWQCB and affirmed by the State Water Resources Control Board in its 2005 review of the Irrigated Lands Conditional Waiver. Stakeholders in the region are working to find a solution that encompasses the protection of public health, meets current and future water quality regulations, and allows for a sustainable agricultural economy.

Relationship with Other Regions

The Sacramento River Hydrologic Region provides the majority of streamflow to the San Francisco Bay Hydrologic Region and is also the major contributor of fresh water to the CVP and SWP delivery systems, which supply portions of the water needs of the following hydrologic regions: San Joaquin River, Central Coast, South Coast, and Tulare Lake.

7.2.1.6 *San Joaquin River Hydrologic Region*

Historically, the surface water originating from Sierra Nevada rivers has proven to be a dependable supply of water, but it meets only half of the region’s total water requirements (DWR, 2005g). Water quality in this Region generally meets the standards for beneficial uses identified in the Central Valley Basin Plan. Imported surface water and groundwater pumping make up the difference. Because the region relies on imported surface water from other regions, there is growing concern over the long-term availability of external supplies.

The major water quality problems of the San Joaquin River Hydrologic Region are a result of many factors, including depleted freshwater flows. The San Joaquin River Restoration Program was formed in response to a 2006 settlement of an 18-year-old lawsuit between the U.S. Departments of the Interior and Commerce, the Natural Resources Defense Council, and the Friant Water Users Authority (SJRRP, 2010). The Settlement is based on two goals: the first goal is to restore flows to the San Joaquin River from Friant Dam to the confluence of the Merced River while reducing or avoiding adverse water supply impacts from restoration flows. The second goal is to restore and maintain fish populations in "good condition" in the mainstem of the San Joaquin River downstream from Friant Dam to the confluence of the Merced River, including naturally-reproducing and self-sustaining populations of salmon and other fish. Restoring flows to the San Joaquin River to meet these goals includes improving water quality conditions in the restoration reaches for the benefit of fish, wildlife, and other beneficial uses, including agricultural and municipal supply.

Other major water quality problems in the San Joaquin River Hydrologic Region include municipal and industrial wastewater discharges, salt loads from agricultural drainage and runoff, and other pollutants associated with long-term agricultural irrigation and production, including nutrients, selenium, boron, and organophosphate pesticides. The entire Central Valley, which includes the San Joaquin River, Sacramento River, and Tulare Lake basins, has 40 waterbodies that are impaired due to agricultural drainage and runoff, including 800 miles of waterways, and 40,000 acres of the Delta. In its 2005 Triennial Review of its basin plan, the Central Valley RWQCB identified high priority problems as salinity and boron discharges to the San Joaquin River, low dissolved oxygen problems in the lower San Joaquin River, control of organophosphorous pesticides, and the need for stronger policies to protect Delta drinking water quality.

High salinity is a problem in the San Joaquin River basin because of the greatly altered flows of the river, most of which is diverted from its natural course at Friant Dam. In addition, imported irrigation water from State and federal projects annually transport more than a half million tons of salts into the west side of the San Joaquin River region. Water released from New Melones Reservoir on the Stanislaus River is used to help meet the salinity and dissolved oxygen requirements at Vernalis on the lower San Joaquin River. Agricultural drainage and discharges from managed wetlands are already regulated in the 370,000-acre Grasslands watershed, which contributes high levels of salts, selenium, boron, and nutrients to Mud and Salt sloughs. These sloughs are some of the primary contributors of selenium to the San Joaquin River. Dairies, stockyards, and poultry ranches are also a concern in the region because they generate waste products including pathogens, nutrients, salts, and emerging contaminants[5] of concern that enter the waterways. Some dairies and other agricultural operations are already subject to regulatory review. Water releases from managed wetlands, a part of the State and federal wildlife refuge system, also

[5] Emerging contaminants are hazardous materials or mixtures (naturally occurring or humanmade chemical, microbial, or radiological substances) that are characterized by having: (1) a perceived or real threat to human health, public safety, or the environment; (2) no published health standards or guidelines; (3) insufficient or limited available toxicological information or toxicity information that is evolving or being re-evaluated; or (4) significant new source, pathway, or detection limit information.

can discharge salts and nutrients. The erosion of westside streams is the primary source of organochlorine pesticides in the San Joaquin River.

Migrating and spawning salmonids face high temperatures in the Stanislaus, Tuolumne, and Merced rivers downstream from dams during certain times of the year, depending on hydrologic and water supply conditions. Contamination of fish is also a concern in these three rivers, as well as in the mainstem of the San Joaquin River. For example, the Central Valley RWQCB cites one study that found a 43-mile reach of the San Joaquin River (between the confluences with the Merced and the Stanislaus rivers) to be toxic to fish approximately half the time. In the lower San Joaquin River, low dissolved oxygen levels in the Stockton Deepwater Ship Channel are attributable to warm temperatures, low flows, nutrients, and channel configuration. This portion of the river with low dissolved oxygen is potentially a barrier to fall-run Chinook salmon migrating upstream to the Merced, Tuolumne, and Stanislaus rivers to spawn.

In relation to other geographic regions of the State, water discharges from irrigated lands have their greatest impact to water quality in the Central Valley, which covers 40 percent of California's land area and contains seven million irrigated acres and more than 25,000 individual agricultural dischargers.

Although existing agricultural land use practices affect water quality now, the expanding urbanization of Central Valley cities will generate new and different water quality problems in the future. Since the late 1970s, landscape irrigation with recycled water is an increasingly used strategy to reduce potable water demand and reduces the volume of water wasted after a single use (SWRCB, 1977). The SWRCB prescribes general waste discharge permits for municipal wastewater discharge systems to construct and operate more costly tertiary wastewater treatment facilities to use recycled water and prevent water quality impacts to current and possible future beneficial uses (SWRCB, 2009).

Relationship with Other Regions

The San Joaquin River Hydrologic Region depends on receiving surface water from other regions of the State to meet a portion of its developed agricultural and urban water uses. For many years, the region has received imported CVP water from the Sacramento-San Joaquin Delta via the Delta Mendota Canal, and from CVP Friant Dam on the upper San Joaquin River. This region also receives some SWP water from the California Aqueduct.

Some surface water supplies that originate in the San Joaquin Hydrologic Region are also diverted across the valley to the San Francisco Bay Hydrologic Region via the Mokelumne Aqueduct and the Hetch Hetchy Aqueduct. The average annual diversions made by these two projects from the Mokelumne and Tuolumne rivers are approximately 245,000 acre-feet per year through the Mokelumne Aqueduct, and 267,000 acre-feet per year through the Hetch-Hetchy Aqueduct (DWR, 2005g).

7.2.1.7 *Tulare Lake Hydrologic Region*

The Tulare Lake Hydrologic Region is in the southern end of the San Joaquin Valley. This region includes all of Tulare and Kings counties and large portions of Fresno and Kern counties.

Agricultural runoff and drainage are the main sources of nitrate, pesticides, and selenium that endanger groundwater and surface water beneficial uses (DWR, 2005h). In locations where groundwater quality is marginal to unusable for agriculture, farmers use good quality surface water to irrigate crops or blend higher quality surface water with poor quality groundwater to create a larger supply. The basin also has a relatively large concentration of dairies that contribute microbes, salinity, and nutrients to both surface water and groundwater. In addition, oilfield waste has impacted water quality. According to the Central

Valley Basin Plan, there are more than 800 oilfield waste dischargers, of which 250 are regulated pursuant to waste discharge requirements.

The quality of local surface water from the Kings River and the San Joaquin River (diverted south through the Friant-Kern Canal) is generally considered excellent for irrigation, municipal, and industrial uses. However, the Central Valley RWQCB specifically identified salinity in the lower Kings River as a water quality priority in its 2007 Triennial Review. On the west side of the region, DWR has sought solutions to the flooding on the Arroyo Pasajero, which threatens the California Aqueduct. The aqueduct, which forms a barrier to arroyo floodwaters and sediment flow, is at risk of failure during major rainstorms in the watershed. Also, the naturally occurring asbestos in the arroyo sediments that enter the aqueduct during floods has raised questions of possible health risks. Both Panoche and Silver creeks contribute large sediment loads to the valley floor, and Panoche Creek also contains elevated levels of selenium.

In addition, drainage water is sometimes contaminated with naturally occurring, but elevated, levels of selenium, boron, and other toxic trace elements that threaten the water quality, environment, and fish and wildlife. Water planners had originally envisioned a master surface water drain to remove this poor quality water, but that proposal was never implemented. Reclamation has an obligation to provide agricultural drainage service to farm lands served by the CVP on the west side of the valley. To convey this sometimes contaminated drainwater more directly to the San Joaquin River and away from the sensitive San Luis National Wildlife Refuge Complex, a portion of the San Luis Drain was reopened in September 1996 as part of the Grassland Bypass Project. The San Luis Drain was modified to allow drainage through six miles of Mud Slough, a natural waterway that passes through the San Luis National Wildlife Refuge Complex and a section of the North Grassland Wildlife Area.

San Joaquin Valley agricultural drainage water quality monitoring began in 1959 as a cooperative agreement between DWR and the University of California. In 1984, the San Joaquin Valley Drainage Program was established as a joint federal and State effort to investigate drainage and drainage-related problems and identify possible solutions. In September 1990, the San Joaquin Valley Drainage Program summarized its findings and presented a plan to manage drainage problems in a report titled "A Management Plan for Agricultural Subsurface Drainage and Related Problems in the Westside San Joaquin Valley."

Relationship with Other Regions

The Tulare Lake Hydrologic Region receives CVP water from the San Joaquin River region via the Friant-Kern Canal and imported water from the Sacramento-San Joaquin Delta via the California Aqueduct and the San Luis and Delta-Mendota canals. The economic health of the region depends heavily on the availability of imported surface water to meet current and future needs.

7.2.1.8 *South Lahontan Hydrologic Region*

The quality of the limited surface water resources is excellent in the South Lahonton Hydrologic Region, and is influenced greatly by snowmelt from the eastern Sierra Nevada (DWR, 2005i). However, at lower elevations, groundwater and surface water quality can be degraded, both naturally from geothermal activity, and as a result of recreational uses and cattle grazing. Nutrients entering Crowley Reservoir, on the Owens River south of Mono Lake, have contributed to low dissolved oxygen levels in the reservoir. Water quality and quantity are inherently related in the Owens River watershed because of the large exports of surface and groundwater to the City of Los Angeles. Arsenic, a known human carcinogen, is a health concern in the basin, and therefore, in Los Angeles as well, especially with the recently proposed lower drinking water standard for this chemical. In its 2003 Triennial Review, the Lahontan RWQCB identified the need for site-specific ammonia objectives for Paiute Ponds and Amargosa Creek in Los Angeles County (LRWQCB, 2007). The monitoring and cleanup of chromium in groundwater and the cleanup of sites contaminated by mining wastes are additional water quality needs for this region.

Relationship with Other Regions

Although most of Mojave Water Agency's (MWA) service area is in the South Lahontan Hydrologic Region, a portion of its service area extends into the Colorado River Hydrologic Region (Lucerne and Johnson valleys and the Morongo Basin). The service area includes the community of Yucca Valley, which has an allocation for up to 7,200 acre-feet of MWA's surface water from the SWP. Imported SWP water is used to recharge groundwater supplies in the Mojave River Valley basins. Some of these surface water and groundwater supplies are also exported from the Owens and Mono portions of the South Lahontan Hydrologic Region to the South Coast Hydrologic Region by the Los Angeles Department of Water and Power via the Los Angeles Aqueduct.

7.2.1.9 *Colorado River Hydrologic Region*

The Salton Sea, with its increasing salinity, selenium contamination, and nutrient enrichment (i.e., eutrophication), is the primary focus of water quality issues within the Colorado River Hydrologic Region (DWR, 2005j). The largest sources of surface water inflow to the sea are the New and Alamo rivers and the Imperial Valley agriculture drains, all of which contribute pesticides, nutrients, selenium, and silt. The New River has been described as the most polluted river in the United States. Originating in Mexicali, Mexico, the New River flows across the border, through the City of Calexico, and continues north, where it empties into the Salton Sea. It conveys urban runoff, untreated and partially treated municipal and industrial wastes from the Mexicali Valley, and agricultural runoff from the Mexicali and Imperial valleys. These pollution sources contribute pesticides, pathogens, silt, nutrients, trash, and volatile organic compounds (the latter, primarily from Mexican industry) to the Salton Sea. The Alamo River, which originates two miles south of the border and also flows north to the Salton Sea, consists mainly of agricultural drainage from the Imperial Valley. The Coachella Valley Stormwater Channel, which also drains to the Salton Sea, is heavily contaminated at its north end with pathogens from municipal wastewater plants in the Coachella Valley and agricultural drainage.

A multiagency group, The Citizen's Congressional Task Force on the New River, was created in 1997. Its mission is to improve agricultural drain water quality that flows into the New River and, ultimately, to the Salton Sea. Participating agencies include the Imperial Irrigation District, Desert Wildlife Unlimited, County of Imperial, Reclamation, U.S. Geological Survey, USFS, DFG, California RWQCB, U.S. Environmental Protection Agency (USEPA), Ducks Unlimited, and U.C. Riverside. In 2000, the Task Force constructed two pilot wetland projects (a seven-acre site near Brawley and a 68-acre site near Imperial) to test the effectiveness of constructed wetlands in lowering non-point source pollutants. Due to the success of the pilot sites, up to 30 additional wetland sites are proposed on both the New and Alamo rivers.

Contamination in the Salton Sea presents threats to migrating birds on the Pacific Flyway. At certain times of the year, nutrient loading to the Salton Sea supports large algal blooms that contribute to odors, as well as low dissolved oxygen levels, which adversely affect fisheries. Selenium is a more recent constituent of concern, and has the potential to adversely affect fish and wildlife.

The relatively saline Colorado River provides irrigation and domestic water to much of southern California. USEPA first discovered low levels of perchlorate in the Lower Colorado River in 1997 from a Kerr-McGee chemical facility in the Las Vegas Wash, the nation's largest perchlorate contamination site. Cleanup of this site commenced in 2002 and has reduced perchlorate levels in the wash by 70 percent within the first two years (USEPA, 2004). Septic systems at recreational areas along the river are also a concern for domestic and recreational water uses.

Relationship with Other Regions

The Coachella Valley Water District and Desert Water Authority receive their annual allocations of SWP water through an exchange agreement with Metropolitan Water District of Southern California (MWD), the South Coast Hydrologic Region's largest water wholesale agency. These districts are also participants in another agreement that delivers and stores water from the Colorado River into the Coachella Valley's largest groundwater basin during periods of high flows.

7.2.2 Secondary Study Area

7.2.2.1 *Overview*

The water quality of the Sacramento River is affected by a variety of factors, including weather, geology, water storage projects (reservoirs), tributary streams, agricultural runoff, municipal and industrial discharges, and non-point sources, such as instream transport of stream-bottom sediments with elevated levels of heavy metals, and importation of water from other watersheds. Water quality in the mainstem of the Sacramento River is affected by releases from Shasta Dam, which forms Shasta Lake. Water quality in Shasta Lake is affected largely by three tributaries (McCloud, Pit, and Sacramento rivers) and the geochemical and biochemical processes occurring within the reservoir.

Many of the Sacramento River tributaries downstream from Shasta Dam are also regulated by reservoirs, which affects their water quality. Spring Creek Reservoir releases water to Spring Creek (contaminated with acid mine drainage), which is tributary to Keswick Reservoir. Clear Creek was impounded to form Whiskeytown Reservoir, through which water from the Trinity River is diverted into the Sacramento River drainage. Stony Creek has three reservoirs including East Park, Stony Gorge, and Black Butte. The mainstem of the Feather River is regulated by Oroville Dam. Upstream from Lake Oroville, the North Fork is regulated by Pacific Gas & Electric Company dams, and the South Fork is regulated by the South Feather Water and Power Agency. Further downstream, Englebright Narrows Dam controls releases to the Yuba River, and Rollins Reservoir controls releases to the Bear River. Releases to Cache Creek are controlled at Clear Lake, and the North Fork of Cache Creek is controlled by Indian Valley Reservoir. River flows in Putah Creek are controlled by the Solano Dam. Folsom and Nimbus dams control flows in the American River. All of these waterbodies flow into the Sacramento-San Joaquin Delta (Delta). The Delta includes rivers, islands and sloughs.

7.2.2.2 *Historic Water Quality of Reservoirs and Rivers*

The chemical quality of Sacramento River tributaries is directly related to the geology in the tributary drainage. Streams draining the igneous formations north and east of the Sacramento Valley are low in dissolved solids and electrical conductivity (EC)[6]. Streams from the coastal sedimentary formation are substantially higher in dissolved solids (salts), and therefore, exhibit higher EC values.

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[6] Electrical conductivity (EC) is a measure of water's ability to conduct an electric current based on its dissolved salt content.

7.2.2.3 *Trinity River Basin Water Quality*

Trinity River water temperatures are influenced by Trinity and Lewiston reservoirs' release temperatures, flow rates, channel geometry, regional meteorology, and tributary flows and temperatures (the effect of Trinity and Lewiston reservoirs diminishes with distance downstream). Generally speaking, the greater the release volumes from the dams, the less susceptible the rivers temperature is to other factors. Trinity Reservoir releases tend to be cold (42°F to 47°F); whereas, Lewiston Reservoir, which is much shallower, tends to provide releases that are more affected by ambient temperatures.

During storm periods, turbidity in the Trinity River from Lewiston Dam to the South Fork is caused primarily by heavy inflows of suspended sediment from tributaries and the reservoirs. Highly erosive soils comprise approximately 17 percent of the Trinity River Basin, resulting in significant sediment loads entering the river. The reduced flows resulting from the construction and operation of the dams are partially responsible for sediment accumulation in the river. High flows, which historically flushed these sediments through the system, have become less frequent and of lower magnitude.

Elevated concentrations of mercury have been found in water, sediment, and biota (fish, frogs, and predatory aquatic insects) in the Trinity River Basin, similar to other river basins in California that have been subjected to historical gold mining operations (USGS, 2005). Sediment samples collected within and adjacent to some planned channel rehabilitation project sites of the Trinity River Restoration Plan contain mercury concentrations that are above what are considered naturally occurring levels.

Natural sources of mercury to the watershed may include wet and dry deposition of mercury from the atmosphere, and indigenous mercury that naturally occurs in rocks and soils. Some elemental mercury was likely introduced to the basin during gold mining operations. This elemental mercury was likely subject to chemical and biological processes that transform some of the elemental mercury into dissolved mercury phases that can become methylated. Sulfate-reducing bacteria in anaerobic environments are typically the source of methylation. The potential for methylation depends not only on solubility of mercury phases present, but also many other chemical variables, such as sulfate and organic carbon, and physical parameters such as temperature, pH, oxidation-reduction potential, and the bacterial community.

The primary source for gold in the Trinity River watershed is low sulfide quartz gold vein deposits. Gold in these deposits is commonly associated with pyrite and minor amounts of base metals. Weathering of these deposits may also cause locally elevated sulfate concentrations and enhance mercury methylation by exposure to sulfate-reducing bacteria. In the upper Trinity River Basin (upstream of Trinity Lake), the Altoona mercury mine in the East Fork Trinity River watershed releases mercury and sulfate that results in methylation of mercury and elevated levels of mercury in downstream plants and animals. Although natural mercury deposits are widespread in western California and are the source of mercury used in placer mining, the Altoona Mine is the only mercury mine in the Trinity Watershed. No information exists to indicate that methylmercury contamination from the Altoona Mine has migrated in significant amounts to areas downstream from Lewiston and Trinity dams, although some preliminary sampling efforts in the basin have been initiated.

Water quality in the lower Klamath River is regulated by the North Coast RWQCB. Standards for the Trinity River generally apply to the Klamath River because beneficial uses are similar, except that there are no time- and location-specific temperature objectives. Current water quality concerns in the Klamath River Basin are the result of agricultural practices, water management, timber harvesting activities, natural geologic instability, and mining operations. Water quality in the lower Klamath River can be influenced by dam releases from Iron Gate Dam on the Klamath River or dam releases from Lewiston

Dam on the Trinity River. Lower in the Klamath River, the effects of the high nutrient loads from the upper basin are typically diluted by tributary flow, including the Trinity River, the largest of its tributaries.

Lower Klamath River water temperatures may be influenced by releases from Iron Gate Dam. However, the Trinity River has a greater influence on water temperature of the Lower Klamath River than the releases from Iron Gate Dam. The two systems are different in that the coldwater storage of Trinity Reservoir is much greater than that of the upper Klamath River Basin reservoirs. Empirical data and a temperature model of the Trinity River has provided insight into the effects that variable Lewiston Dam releases may have on water temperatures at the confluence of the Klamath River at Weitchpec. Empirical data have shown the influence of a high Lewiston Dam release on Klamath River water temperatures. In June 1992, a 10-day Lewiston Dam release of 6,000 cubic feet per second (cfs) occurred and greatly influenced the temperature of the lower Klamath River. This release decreased temperature in the mainstem Klamath River (immediately downstream from the confluence) by nearly 4.5°F. Because 1992 was a Critically Dry water year, tributary accretion in both the Klamath and Trinity rivers was very small. As a consequence, the high release from Lewiston Dam resulted in the Trinity River becoming the dominant cold water source at the confluence. These interactions were confirmed during 2003 operations for late fall temperature maintenance.

Modeled dam releases from Lewiston Dam also provided assessments of the likely effects of releases on water temperatures at the confluence of the Klamath River during the spring and early summer. These evaluations focused on recommended flows identified in the analysis of alternatives, and the following generalities were identified from this evaluation. First, the model predicted that high-level releases can result in Trinity River water temperatures being colder than the Klamath River. Conversely, low-magnitude releases can result in Trinity River water temperatures becoming warmer than the Klamath River in the lower reaches. The main factor that can offset temperature differentials is likely the quantity of tributary accretion. When the Lewiston Dam release is large during Drought conditions (low tributary accretion) or small during Wet conditions, the temperature differentials become greatest. Marked temperature differentials may have a harmful effect on sensitive fishery resources. When dam release magnitudes are matched to emulate pre-TRD hydrologic conditions, the differences are lessened.

7.2.2.4 *Shasta Lake and Vicinity Water Quality*

Water quality in this portion of the Secondary Study Area generally meets the standards for beneficial uses identified in the Central Valley Basin Plan. The quality of surface waters in Shasta County is generally considered good. The following nonpoint pollution sources could affect surface water quality: high turbidity from controllable sediment discharge sources (e.g., land development and roads); high concentrations of nitrates and dissolved solids from range and agricultural runoff or septic tank failures; contaminated street and lawn runoff from urban areas, roads, and railroads; and warmwater discharges into coldwater streams.

The surface water quality of streams and lakes draining the Shasta-Trinity National Forest (STNF) and adjacent private lands generally meets standards for beneficial uses defined by the Central Valley Basin Plan. There are, however, some areas where the water quality does not meet the standards during periods of stormwater runoff because of past management activities. The cumulative impacts of successive activities, such as road construction and timber harvesting on private and National Forest lands, also contribute to the degradation of water quality in the STNF (USFS, 1995).

Approximately 6.2 million acre-feet of water flows annually into Shasta Lake from the Sacramento, McCloud, and Pit River drainages. A favorable inflow-outflow relationship of 1.4 to 1 results in good water quality, both in the lake and downstream (Reclamation, 2011).

Nutrient inputs and bacteria are not of concern in the Sacramento River and McCloud River arms (Reclamation, 2011); however, they could be an issue in the Pit River Arm as a result of runoff from agricultural and range lands in the upper Pit River watershed. Within Little Backbone Creek, Dry Creek, and the Squaw Creek Arm, the waters are locally limited by low pH and elevated concentrations of heavy metals caused by drainage from abandoned mines (Reclamation, 2011). In addition, data suggest that sediment and turbidity locally affect beneficial uses, mainly contact recreation.

7.2.2.5 *Sacramento River Water Quality – Upper Reach*

Shasta Lake is a major controlling factor of water quality in the upper reach (Keswick Dam to Red Bluff Diversion Dam [RBDD]) of the Sacramento River. The main source of water in the Sacramento River downstream from Keswick Dam is snowmelt that collects in upstream reservoirs and is released in response to water needs or flood control. The quality of surface water downstream from Keswick Dam is also influenced by other human activities along the Sacramento River downstream from the dam, including agricultural, historical mining, and municipal and industrial inputs (Reclamation, 2011).

Water quality in the Sacramento River is relatively good. Only during conditions of stormwater-driven runoff are water quality objectives typically not met. Water quality issues within the upper reach of the Sacramento River include the presence of mercury, organochlorine pesticides, trace metals, turbidity, and toxicity from unknown origin (CALFED as cited in Reclamation, 2011). Nutrients, such as nitrate, were found to be low throughout the Sacramento River basin. Water temperature is a principal water quality issue in the upper reach of the Sacramento River.

Significant tributaries flowing to the Sacramento River in this reach include Cow, Bear, Battle, and Paynes creeks from the east, and Spring, Clear, and Cottonwood creeks from the west. Since full operation of the TRD began in 1964, an average of 74 percent of the basin's inflow to the TRD (approximately 988,000 acre-feet) has been exported to the CVP annually. As of 2000, annual exports have decreased to an average of 732,400 acre-feet (Reclamation, 2000). Major discharges to the upper Sacramento River include treated sewage from the cities of Redding, Anderson, and Red Bluff. Industrial discharges are limited; the only significant potential discharge occurs from the Sierra Pacific Industries lumber mill located near Anderson. Previous significant industrial discharges had occurred from the Simpson Lee Paper Products mill located near Anderson, from which dioxin was discharged to the river.

Water temperatures in the upper reach during the summer are substantially cooler than prior to construction of Shasta Dam due to deep water releases from the reservoir made possible by the installation of a Temperature Control Device (TCD). The Shasta TCD was first operated in 1997. Winter temperatures are warmer than pre-Shasta Dam conditions due to heat stored in the reservoir. The combined effects of heat trapped during cool months and deep water releases during warm months have narrowed the seasonal range of temperatures in the upper reach of the Sacramento River Winter and spring river temperatures are relatively constant from Keswick Dam to Red Bluff, and summer and fall temperatures increase with distance downstream.

Settling of particulate matter in Shasta Lake results in low levels of suspended solids, turbidity, and discoloration (a narrative aesthetic criteria), in the river downstream from Keswick Dam (DWR, 1962, 1970). Lowest turbidity in this reach of the river occurs under low flow conditions during the summer and early fall, but increases slightly as the river flows from Keswick Dam to Red Bluff (DWR, 2012). Turbidity spikes occur during major storms, with the largest inputs coming from major tributaries (such as Cottonwood Creek) and bank erosion.

The pH in the upper reach generally ranges from approximately 6.6 to 8.0 (DWR, 2012). The pH remains relatively constant from Keswick Dam to Red Bluff, with no readily apparent seasonal trends.

EC in the tributaries to the upper reach of the Sacramento River is highest during low flow conditions of late summer and early fall due to dissolution of minerals in the substrate, and lowest during winter and spring due to dilution from higher flows. EC in the upper Sacramento River is controlled by water quality in Shasta Lake. It is lowest in the summer months and peaks occur during the winter (DWR, 2012). Highest EC occurs in the deeper waters during the winter, and lowest values occur in the summer (DWR, 2012). Higher EC in the winter in the reservoir is the result of increased mineralization from turbid tributary inflows, and lower EC during the summer occurs due to settling of materials from the water column.

Dissolved oxygen concentrations in the upper river are usually high, ranging from 9.5 to 12 milligrams per liter (mg/L) near Redding with greater than 95 percent saturations (DWR, 1962).

Nutrient levels are generally low in the upper reach of the river (DWR, 1970, 1973). Lowest levels of total phosphorus occur during the summer months, which may be due to uptake of nutrients by periphyton[7]. Total phosphorus was not found at levels exceeding 0.05 mg/L for this reach of the river.

One of the major sources of water quality degradation in this reach of the river stems from heavy metal contamination from acid mine drainage upstream from Keswick Dam. Heavy metals and acid are released by oxidation of massive fine-grained sulfide ores in abandoned surface mines, subsurface mines, and tailings. the resultant acidic solution causes further dissolution of heavy metals from the ores. Periodic fish kills investigated by the California Fish Commission since 1899 have been attributed to extremely acidic waters with high concentrations of iron, copper, zinc, cadmium, aluminum, and other heavy metals (USEPA, 2006).). Several tributaries to Shasta and Keswick reservoirs carry high concentrations of dissolved metals. As of 2006, acid mine drainage still escaped untreated from waste piles and seepage on the north side of Iron Mountain and flowed into Boulder Creek. USEPA continues to investigate and plan future actions to control acid mine drainage in the Boulder Creek catchment.

In 1983, USEPA placed the Iron Mountain Mine (IMM), which is the principal discharger of acid mine drainage in the Spring Creek watershed, on the National Priorities List (Superfund Site), and initiated actions to prevent formation of acid mine drainage. The acid mine drainage from IMM is among the most acidic and metal-laden anywhere on Earth. In 1989, USEPA removed tailings to a disposal cell near the top of Iron Mountain, and in 1994 a water treatment plant was built at Minnesota Flats. This facility, which has been expanded and upgraded since it was first constructed, uses lime (calcium oxide, CaO) to neutralize the acid. USEPA estimates that these cleanup actions control more than 99 percent of the copper, cadmium, zinc, and other metals that historically discharged to the Sacramento River. USEPA is now focusing actions on removing sediments contaminated by the previous acid mine discharges from the Spring Creek arm of Keswick Reservoir (USEPA, 2006).

[7] Periphyton are micro-organisms attached to, and living on, submerged solid surfaces and are useful indicators of water quality.

7.2.2.6 *Sacramento River Water Quality – Middle Reach*

The middle reach (RBDD to Colusa) of the Sacramento River flows mostly through recent alluvium and has formed a floodplain that ranges from one to five miles wide. The gradient decreases from approximately 2.5 feet per mile at Red Bluff to 1.3 feet per mile near Colusa. A regular riffle-pool sequence is evident in unaltered areas, but is less apparent in the river downstream from Princeton. The riverbed is essentially gravel and cobble in the upper portions of this reach, with gravel becoming less apparent downstream from the confluence of Stony Creek at river mile (RM) 190. Near Colusa, the riverbed is predominantly coarse sand with gravel occurring in crossover areas (DFG, 1982).

Tributary inflows of some significance in the middle reach of the Sacramento River include Antelope, Mill, Deer, and Big Chico creeks from the east, and Elder, Thomes, and Stony creeks from the west. Agricultural diversions are common in this reach of the river. Some of the major diversions include the Corning, Tehama-Colusa (T-C), Glenn-Colusa Irrigation District (GCID), Provident Irrigation District, and River Branch canals. In addition, several smaller diversions by private farming interests are present in this reach.

Winter water temperatures in the middle reach generally range from 45°F to 50°F (DWR, 2012) and decline in a downstream progression (DWR, 1962). Water temperatures in this reach during the rest of the year are higher than those in the upper reach and increase as the river flows from Red Bluff to Colusa. The most dramatic increases in temperatures predictably occur during warm periods with low flow (late summer and early fall). In addition, seasonal and diurnal fluctuations of water temperatures in this reach are greater than the upper reach, which is due largely to the river moving toward equilibrium with atmospheric conditions as it flows further from Shasta Reservoir.

Suspended solids, turbidity, and discoloration have been found to increase in a downstream progression (DWR, 1962, 1970, 1973). However, during late summer and early fall, when turbidities are lowest, the trend is far less evident. Turbidity levels are highest during the winter and early spring, due to tributary runoff and bank erosion from higher flows (DWR 1970, 1973). Some of the highest suspended solids levels observed were found early in the winter of 1978, with some levels showing a five-fold increase over historic data. This was due largely to heavy accumulations of sediments that occurred during the drought years of 1976 and 1977 (DWR, 1979).

The median pH of this reach of the river was found to be 7.3 (DWR, 1962); data collected from 1998 to 2012 show that pH ranges from 6.3 to 8.4 (DWR, 2012). The pH of the middle reach is slightly greater than the upper reach, particularly during late summer and early fall.

EC continues to increase in a downstream progression in this reach, with levels nearly always higher in this reach than in the upper reach (DWR, 2012). Data collected from 1998 to 2012 show EC in the upper reach ranging from 79 to 136 µmhos/cm, while ranging in the middle reach from 81 to 170 µmhos/cm. Typically, lowest EC in the river occurs during the summer, and highest levels occur in the winter. This seasonal difference in EC appears to be related to the limnology and operation of Shasta Reservoir. However, hydrologic factors operating in various years can alter this pattern. In 1960 to 1961, EC was lowest during the spring due to dilution from snowmelt runoff (DWR, 1962). In 1970, lowest EC levels in the river occurred during a series of January storms that caused excessive flooding, which resulted in dilution of mineral loads.

Nutrient levels tend to increase during the winter and in a downstream direction (DWR, 1970, 1973). Total phosphorus levels were nearly always higher in the middle reach than the upper reach of the Sacramento River.

7.2.2.7 *Sacramento River Water Quality – Lower Reach*

Water quality in the lower reach (Colusa to Verona) of the Sacramento River is affected by agricultural runoff, acid mine drainage, stormwater discharges, diversions, urban runoff, and water releases from dams. However, the flow volumes generally provide sufficient dilution to prevent excessive concentrations of contaminants in the river.

Several TMDLs are currently proposed for the lower reach of the Sacramento River. In addition, the Sacramento River downstream from RBDD to Knights Landing is listed as an impaired water body pursuant to Section 303(d) of the Clean Water Act (CWA) for mercury and unknown toxicity.

Elevated metals and pesticide levels have been found at some sites in the Sacramento River Valley downstream from Knights Landing. The parameters of concern in the Sacramento River from Knights Landing to the Delta include diazinon, mercury, and unknown sources of toxicity (SWRCB, 2007).

The Colusa Basin watershed covers approximately 1 million acres in Glenn, Colusa, and Yolo counties (WRA, 2007). The Colusa Basin Drain (CBD) is designed to convey drainage flows from agricultural lands and 32 ephemeral streams during the irrigation season to the Knights Landing outfall gates and stormwater flows during the winter. The Colusa Bain Drain drains approximately 1,620 square miles in the Sacramento Valley, and includes portions of Glenn, Colusa, and Yolo counties. The Canal starts in Glenn County northeast of the city of Willows and runs in a southerly direction for 70 miles to Knights Landing in Yolo County.

Water quality in this reach is influenced by agricultural drainage and the Feather River. Significant quantities of suspended sediments, turbidity, dissolved solids, minerals, and nutrients, as well as pesticides in some cases, are added to the Sacramento River via the CBD. The fifth Annual Monitoring Report for the Sacramento River Watershed Program (SRWP, 2004) reported monitoring results collected from 1997 to 2003. Drinking water parameters of potential concern included in the SRWP monitoring program include organic carbon, total dissolved solids, pathogens, turbidity, and nutrients. Organic carbon is of concern primarily due to its role in the creation of carcinogenic trihalomethanes (THMs) and other disinfection by-products during disinfection of source water.

Total dissolved solids (TDS) can have an important effect on the taste and palatability of drinking water, and at very high levels may cause health problems in sensitive individuals. The presence of high levels of TDS may also be objectionable to consumers owing to the resulting excessive scaling in water pipes and fixtures, heaters, boilers, and household appliances.

The highest concentrations of most drinking water parameters of concern were generally observed in agricultural drains (Sacramento Slough and CBD) and in urban drainages and creeks (Natomas East Main Drain, Arcade Creek) (SRWP, 2004). Concentrations of methylmercury in particulate matter (expressed as nanograms of particulate methylmercury per gram of suspended solids) in the mainstem exhibit no apparent spatial trend between Hamilton City and Greene's Landing (SRWP 2004). The CBD and Sacramento Slough exhibited methylmercury concentrations in particulates that were similar to the lower mainstem Sacramento River, but with much higher concentrations of suspended solids. Concentrations of methylmercury in particulates were dramatically higher in the major tributaries than in the mainstem.

The Feather River provides a substantial quantity of high quality water that generally meets the standards for beneficial uses identified in the Central Valley Basin Plan, to the Sacramento River. The Feather River originates in the volcanic formations of the Sierra Nevada Range and flows southwest to Oroville, where it is impounded behind Oroville Dam. The dam provides coldwater releases to the Feather River from deep within Lake Oroville, a thermally stratified lake. From Oroville, the Feather River flows south through the Sacramento Valley where it is joined by two major tributaries. The Yuba River joins the Feather River at Marysville; the Bear River has its confluence approximately 15 miles farther downstream. The Feather River then joins the Sacramento River at RM 80. The Feather River is generally lower in turbidity, suspended solids, dissolved solids, EC, and nutrients than the Sacramento River (DWR, 2004).

Water temperatures in this reach of the Sacramento River continue to increase in a downstream progression, except during the winter months when temperatures either decline slightly or hold fairly constant as the river flows downstream (DWR, 1962). During most of the year, water temperatures increase downstream from the CBD outfall (and then decline downstream from the Feather River confluence (USGS, 1978, as cited in DWR, 1986). The Feather River is warmer in August than the Sacramento River, resulting in continued warming downstream from their confluence (USGS, 1978, as cited in DWR, 1986).

Seasonal and diurnal temperature fluctuations are greater in this reach than in the upper two reaches (DWR, 2004). Temperatures in this reach have varied from 48°F in January 1984 to 71°F in August 1983.

Turbidity, as well as suspended solids and color, are also greater in this reach than in the upper reach, which is due largely to irrigation return flows, erosion, and algal production (DWR, 1962). However, the pattern is less evident during the late summer and early fall when flows and turbidities are lowest. Highest turbidity levels occur during periods of high rainfall and increased flows (DWR, 1970). The increase in turbidity as the Sacramento River flows downstream is interrupted at the confluence with the Feather River. The inflowing low turbidity water of the Feather River results in decreased turbidity in the Sacramento River downstream from their junction. Turbidity in this reach has been found to range from 2.5 FTUs8 in October to 46 FTUs during a storm in late November.

Monitoring results from the 2011 Annual Monitoring Report (AMR) of the Sacramento Valley Water Quality Coalition identified several herbicides and pesticides above laboratory detection levels including disulfoton from Sacramento Slough at Karnak, and Malathion, methomyl metolachlor, oxyfluorofen, simazine, and chlorpyrifos from the CBD at Highway 20 (SVWQC, 2012). However, these levels did not exceed Central Valley Basin Plan criteria or result in exceedences of sediment toxicity thresholds. The report identified three monitoring events when dissolved oxygen levels failed to meet objectives to protect the COLD beneficial use (7.0 mg/L), and one that failed to meet the WARM beneficial use goal (5.0 mg/L). On four monitoring events at the CBD at the Highway 20 location, measured EC levels failed to meet the Agricultural goal of 700 μmhos/cm, with two of these events also exceeding the California recommended 2° Maximum Contaminant Level of 900 μmhos/cm for drinking water. Monitoring results for E. coli, nutrients, pH, and trace metals met relevant Central Valley Basin Plan goals.

EC in this reach follows a pattern similar to the upper two reaches. Historical data indicate that EC is generally higher in the winter and lower in summer. However, hydrologic conditions interrupt this pattern from time to time. EC in 1970 was lowest during a January flood (DWR, 1970), but has been lowest at

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8 The most widely used measurement unit for turbidity is the FTU (Formazin Turbidity Unit).

other times in the spring due to heavy runoff from snowmelt (DWR, 1962). In addition, agricultural practices in this reach may interrupt the seasonal pattern. EC was found to increase substantially during mid-September 1983, which corresponds to the period that rice fields were drained for harvest. EC during 1983 and 1984 ranged between 115 and 175 µmhos/cm.

EC in the lower reach of the river is greater than in the upper two reaches (DWR 1970, 1973). Substantial increases have been noted downstream from the CBD outfall.

DWR (1990) indicated that irrigation return waters increase EC in the river during most of the year, except during the spring.

The trend of increasing EC as the river moves downstream is interrupted at the confluence with the Feather River. The Feather River has lower EC than the Sacramento River, which results in lower EC in the Sacramento River downstream from the confluence with the Feather River (DWR, 1962, 1970, 1973). Nutrient concentrations in this reach tend to increase in a downstream progression, but decrease downstream from the confluence of the Feather River (DWR, 1970, 1973). Phosphorus and carbon concentrations are higher in the Sacramento River than in the Feather River. Nutrient concentrations are nearly always higher in the agricultural drains than the mainstem and result in increased concentrations in the river downstream from their outfalls.

Dissolved oxygen fluctuates more in this reach than in the upper reaches (DWR, 2004), which is due largely to seasonal temperature regimes. Concentrations of oxygen are highest in the winter when temperatures are lowest, and are lowest in the summer when temperatures are highest. Dissolved oxygen concentration decreases slightly downstream, due to increased temperatures and increased waste discharges (DWR, 1962). The Feather River, for the most part, has higher concentrations of oxygen than the Sacramento River. However, during low flow conditions, when the Feather River sometimes becomes warmer than the Sacramento River, dissolved oxygen may be higher in the Sacramento River. The diurnal dissolved oxygen cycle in this section of the river follows a predictable pattern. During August, oxygen concentrations increase in the afternoon due to photosynthetic activity and then decline at night (USGS,1978, as cited in DWR, 1986). Similar trends are seen in the Feather River during the same period. During November, however, no clear diurnal dissolved oxygen cycles were observed in the Feather River and Sacramento River downstream from the Feather River. Dissolved oxygen levels never declined significantly, indicating no waste assimilation problems in this reach.

7.2.2.8 *Lower Feather River Water Quality*

The quality of water in Lake Oroville is affected largely by upstream tributaries. Water released from Oroville Dam determines water quality downstream in the Feather River, which subsequently determines water quality in the Thermalito Forebay and Afterbay (DWR, 2004).

Thermal stratification during the summer in Lake Oroville occasionally leads to reduced dissolved oxygen conditions near the bottom of the water column. Nutrients and minerals in the reservoir were found at levels consistent with existing and proposed criteria, except for total phosphorus, which was occasionally at levels exceeding concentrations in the upstream tributaries and recommended water quality criteria. Metals exceeding various criteria in the reservoir included arsenic, aluminum, copper, iron, manganese, and lead. However, these and other metals are contributed to the reservoir in concentrations exceeding various criteria by the upper tributaries.

Water temperatures downstream from Oroville Dam are controlled by temperature requirements at the Feather River Fish Hatchery and Robinson Riffle. Releases are made from the reservoir to provide temperatures suitable for fish propagation at the hatchery, which also generally meets temperature requirements at Robinson Riffle. Water released from the reservoir to comply with fishery temperature needs conflicts with temperature requirements for other beneficial uses, such as irrigation.

Water quality in the Feather River downstream from Oroville Dam is affected by the reservoir. Dissolved oxygen levels in the Feather River are infrequently found at levels less than those suitable for beneficial uses. Turbidity levels in the river downstream from the dam are less than those measured in tributaries to Lake Oroville, indicating that the reservoir acts as a settling basin for the turbid inflows. Nutrients and minerals downstream from Oroville Dam are at levels suitable for all beneficial uses. Metals in the Diversion Pool at the base of the dam reflect the quality of water in the reservoir near the dam. Further downstream, accretions to the river from tributaries, storm drains, surface runoff, and other sources affect water quality in the river. Metals occasionally exceeding various criteria in the Feather River downstream from the Fish Barrier Dam include aluminum, arsenic, cadmium, copper, iron, and mercury.

Metals occasionally exceeding criteria in features of the Thermalito Complex include aluminum, arsenic, cadmium, iron, manganese, and lead. Some ponds in the Oroville Wildlife Area also occasionally were found with reduced oxygen levels, and elevated levels of aluminum, arsenic, iron, and manganese.

Pesticides are not found in the lower Feather River, though diuron was found upstream from Lake Oroville in the South Fork Feather River. MTBE was detected in the Diversion Pool.

Both total and fecal coliform bacteria are found from all water quality monitoring sites, but only fecal coliform bacteria exceed criteria. Total and fecal coliform and enterococcus bacteria are found at all swim areas and are present at some swim areas at densities greater than criteria. In addition to human contact with water, high wildlife use of the swim areas could contribute bacterial contamination.

The phytoplankton communities in Lake Oroville and the Thermalito Complex are dominated by diatoms; green algae are dominant in ponds in the Oroville Wildlife Area. Periphyton communities in the river are also generally dominated by diatoms, which are indicative of aquatic ecosystems that are not nutrient rich.

Aquatic macroinvertebrates in the Feather River are dominated by species that adapt readily to disturbed ecosystems. The species composition in the river near the dam is typical of that downstream of large reservoirs. Further downstream, habitat conditions allow additional species to colonize.

Sites both upstream and downstream from Lake Oroville produced toxic effects to test organisms in bioassays. Both survival and reproduction of *Ceriodaphnia* (a water flea) and survival and growth of fathead minnow are affected.

Total suspended and settleable solids are usually reported at very low levels in both upstream tributaries and the lower Feather River. Highest total suspended and settleable solids levels are usually found during winter months.

Water quality in the Feather River is potentially affected by treated sewage discharged through the Sewage Commission Oroville Region (SCOR) Outlet to the Feather River downstream from the Afterbay Outlet. Monitoring of gravels and water upstream and downstream from the SCOR Outlet produce variable results.

Periphyton and macroinvertebrate communities in the tributaries to Lake Oroville are indicative of healthy ecosystems. Both periphyton and macroinvertebrate communities are similar to those found in the Feather River downstream from Oroville Dam in the low-flow section, as well as other streams in which anadromous salmonids spawn. Comparisons of the periphyton and macroinvertebrate communities in the upper tributaries with communities in the low-flow channel and other streams do not indicate that the upstream tributaries suffer from nutrient deprivation due to purported blockage of salmonid spawning in the upper tributaries caused by Oroville Dam.

7.2.2.9 *Lower American River Water Quality*

Surface water quality in Folsom Reservoir, Lake Natoma, and the lower American River depends primarily on the mass balance of various water quality constituents from groundwater inputs, tributary inflow, permitted discharges from municipal and industrial sources, indirect watershed runoff (unchannelized flow), urban runoff, and stormwater discharges (Reclamation, 2009). Water quality varies somewhat among years and seasonally within a year, based primarily on these and related factors. The South Fork American River, which contributes to Folsom Reservoir and Lake Natoma, is listed as impaired for mercury; the American River segment from Nimbus Dam to the confluence with the Sacramento River is listed as impaired for both mercury and unknown toxicity.

Historically, water quality parameters for the lower American River have typically been well within acceptable limits to achieve water quality objectives and beneficial uses identified for this waterbody and remain so today. Principal water quality parameters of concern for the river (e.g., pathogens, nutrients, total dissolved solids (TDS), total organic carbon (TOC), priority pollutants, and turbidity) are primarily affected by urban land use practices and associated runoff and stormwater discharges. The stormwater discharges to the river temporarily elevate levels of turbidity and pathogens during and immediately after storm events. TOC and TDS levels in the lower American River are, however, relatively low compared to Sacramento River and Delta waters, and thus, are generally not of substantial concern.

Although urban land use practices, urban runoff, and stormwater discharges all contribute priority pollutants to the river, monitoring results conducted from 1998 to 2001 by the Sacramento River Watershed Program did not identify any priority pollutant at concentrations consistently above State water quality objectives (SRWP, 2004). However, water quality objectives for dissolved oxygen, temperature, and pH are not always met in the lower American River. Finally, taste and odor problems occasionally arise (generally during the late summer months) in the domestic water supplies taken from the lower American River at the Fairbairn Wastewater Treatment Plant.

Water released from Folsom Reservoir through Lake Natoma and into the lower American River can affect several water quality parameters in the river. In addition, operation of Folsom Dam and Reservoir directly affects lower American River temperatures throughout much of the year. Water temperatures in the lower American River are often unfavorably high for salmonids during the summer and fall months of the year. Elevated river temperatures can be particularly problematic to the river's salmonid resources during low-flow conditions, which occur during the drier years.

7.2.2.10 *Sacramento-San Joaquin Delta Water Quality*

Water quality in the Delta is highly variable temporally and spatially and is a function of complex circulation patterns that are affected by inflows, pumping for Delta agricultural operations and exports, operation of flow control structures, and tidal action. The existing water quality problems of the Delta system may be categorized as the presence of toxic materials, nutrient enrichment (eutrophication), and associated fluctuations in dissolved oxygen, the presence of suspended sediments and turbidity, salinity, and the presence of bacteria (Reclamation, 2011).

The Delta waterways within the area of Central Valley RWQCB's jurisdiction are listed as impaired on USEPA's 303(d) list for dissolved oxygen, EC, DDT, mercury, Group A pesticides, diazinon and chlorpyrifos, and unknown toxicity (SWRCB, 2007). The Delta, which is within the jurisdiction of the San Francisco Bay RWQCB, is listed as impaired for mercury, chlordane, selenium, DDT, dioxin compounds, PCB compounds, dieldrin, diazinon, exotic species, and furan compounds (SWRCB, 2007).

Organic carbon in the Delta originates from runoff from agricultural and urban land, drainage water pumped from Delta islands that have soils with high organic matter, runoff and drainage from wetlands, wastewater discharges, and primary production in Delta waters. Delta agricultural drainage can also contain high levels of nutrients, suspended solids, organic carbon, minerals (salinity), and trace chemicals, such as organophosphate, carbamate, and organochlorine pesticides.

Water temperatures and dissolved oxygen levels in the Delta and Lower San Joaquin River can act as a barrier to salmon migration and survival, and introduced aquatic invasive species and Delta pumping for export also affect native aquatic species survival.

Applicable California RWQCB impaired waters for the Secondary Study Area include SWRCB Regions 1 and 5 are listed in Appendix 7A. Applicable Central Valley Basin Plan water quality criteria (CVRWQCB, 2011) are listed in Appendix 7B.

7.2.3 Primary Study Area

7.2.3.1 *Overview and Methodology*

The proposed Project features are located in Glenn and Colusa counties west of the Sacramento River, and extend into the Coast Range foothills. Elevations within these counties range from approximately 35 feet along the Sacramento River to 3,000 feet in the foothills. This area is characterized by seasons of hot dry summers and moderately cold moist winters. Summer temperatures commonly exceed 100°F. Approximately 95 percent of the annual precipitation occurs during the winter months. Precipitation ranges from approximately 18 inches per year on the valley floor, 21 inches per year at Stony Gorge Reservoir, and 51 inches per year at the upper elevations of the Coast Range crest. Precipitation generally approaches the area from the west, is highest at the Coast Range crest, and diminishes as elevations drop toward the Sacramento Valley in a "rain-shadow" effect.

The proposed Sites Reservoir would impound Stone Corral and Funks creeks, as well as inundate Salt Lake. The chemical quality of waters in this area is directly related to the geology in the tributary drainage, as well as agricultural and cattle grazing land uses. Streams from the coastal sedimentary formation are substantially higher in dissolved solids and EC than the Sacramento River.

DWR began monthly sampling of streams in the Primary Study Area in 1997, including physical parameters, nutrients, minerals, and metals in the water column (DWR, 2012), as well as mercury analysis of sport fish tissues collected from nearby existing reservoirs, including East Park, Stony Gorge, and Black Butte (DWR, 2007). Routine water quality monitoring by DWR was periodically suspended due to funding limitations during portions of 2008 and 2009, and ended following the January 2010 monitoring run. Sampling results were then compared to Central Valley Basin Plan water quality criteria (CVRWQCB, 2011) (Appendix 7B) and USEPA ambient water quality criteria to prevent nuisance algal growth in streams (USEPA, 2001).

7.2.3.2 *Water Quality*

Existing Nearby Reservoirs

East Park and Stony Gorge reservoirs were sampled during the summer of 2000 to evaluate the extent of mercury contamination in fish because these reservoirs are representative of conditions that could be expected in the proposed Sites Reservoir. DWR analyses of total recoverable mercury indicate that levels in samples collected near the bottom of the water column at Stony Gorge and Black Butte reservoirs,exceeded the California Toxics Rules (CTR) for protection of human health. Methylmercury is assumed to be the form of mercury available for bioaccumulation in the food web. Most mercury in fish tissues is in the methylmercury fraction. Total mercury, however, is typically analyzed from fish tissue and is assumed to represent the methylmercury content of tissues.

Fish tissue samples were collected by DWR from East Park and Stony Gorge reservoirs during 2000 to 2001. Neither catfish nor bass composites collected from East Park Reservoir exceeded the OEHHA screening value or USEPA criterion, although mercury levels in the small-sized bass approached these values, and a very large channel catfish that was analyzed individually contained tissue mercury at over twice the level of the screening value and criterion limits. Mercury concentrations in tissues of channel catfish collected from Stony Gorge Reservoir contained levels less than the screening value and criterion (DWR, 2007).

Salt Lake

Salt Lake, located within the proposed Sites Reservoir inundation area, is a 28-acre area of impounded water and seasonal wetlands formed by warm salt springs that occur upslope Salt Lake was sampled on a few occasions during 1997 to 1998; therefore, it is difficult to make an assumption regarding the quality of water from this location. From these samples, it was found that waters from this location are extremely high in minerals. The EC value on one occasion reached 194,100 micromhos per centimeter. The TDS measurement at this time was 258,000 mg/L. EC, TDS, sodium, and boron exceeded all Central Valley Basin Plan criteria. A few metals also were noted at very high concentrations (aluminum, iron, and manganese) and exceeded all criteria, and a few others exceeded some criteria (arsenic, copper, lead and nickel). Levels of ammonia and orthophosphate also were noted at high levels and exceeded criteria. Temperatures from this site were variable, and probably depend on seasonal conditions. Concentrations present in water from this site likely depend on the season and flow.

Funks Creek

Funks Creek originates at approximately 850 feet elevation in the foothills west of Antelope Valley. The banks of this intermittent stream are heavily eroded and the gravel bed is highly disturbed and compacted by cattle. Along the north end of Antelope Valley, Funks Creek receives underground drainage from Salt Lake. Funks Creek widens as it cuts through Logan Ridge and enters the western side of the Sacramento Valley, although flows are still intermittent. Approximately one mile downstream from Logan Ridge, Funks Creek is impounded by Funks Reservoir. This reservoir is fed mainly from waters of the T-C Canal. Downstream from the reservoir, Funks Creek is bordered by agricultural lands, and much of this reach is channelized before emptying into Stone Corral Creek. This portion of Funks Creek likely has some flow year round, due to leakage from the dam at Funks Reservoir.

DWR identified total aluminum levels that exceed Central Valley Basin Plan criteria for protection of aquatic life at the Funks Creek at GCID Canal station. The highest levels of total aluminum were present during storm-related high flow events occurring in the winter months. Arsenic levels consistently met the final USEPA arsenic rule establishing a new MCL of 10 µg/L for total arsenic. However, all water samples analyzed for arsenic from this stream exceeded the much lower California Public Health Goal of 0.004 µg/L. Although copper levels did not exceed criteria in Funks Creek, due to high water hardness, the levels were elevated and would contribute to copper loads imported to the reservoir from Sacramento River diversions. Total recoverable iron levels in Funks Creek ranged as high as 25,200 µg/L during storm-related high flow events. Iron levels also exceeded drinking water, agricultural water, and aquatic life protection criteria. Dissolved iron concentrations were generally below the Central Valley Basin Plan objective. Total recoverable manganese levels occasionally exceeded drinking water standards in Funks Creek, and the Agricultural Goal was rarely exceeded. DWR analyses of total recoverable mercury in Funks Creek indicated levels approached, but did not exceed, the CTR of 50 nanograms per liter (ng/L) for protection of human health. Total recoverable nickel levels in Funks Creek occasionally exceeded the Public Health Goal; total phosphorus levels were at or above the recommended criteria range of 10 to 20 µg/L to prevent excess algal growth.

Stone Corral Creek

Stone Corral Creek originates at approximately 700 feet elevation in the foothills west of Antelope Valley. As the intermittent stream flows into the grasslands of Antelope Valley, the channel is narrow and the banks eroded. The much larger Antelope Creek flows into Stone Corral Creek from the south near the town of Sites. Stone Corral Creek flows through the gap in the foothills and into the western Sacramento Valley.

DWR identified total aluminum levels that exceeded criteria for protection of aquatic life at the Stone Corral Creek near Sites station. As was described above for Funks Creek, samples from Stone Corral Creek also consistently met the final USEPA arsenic rule, and all samples were found at levels that exceeded the Public Health Goal. Stone Corral Creek had hardness levels much higher than found in Funks Creek. Copper levels analyzed from Stone Corral Creek exceeded the hardness-dependent criteria twice. The Central Valley Basin Plan level for dissolved copper was not exceeded in Stone Corral Creek samples.Total recoverable iron levels in Stone Corral Creek ranged as high as 7,420 µg/L during storm-related high-flow events, and occasionally exceeded drinking water and aquatic life criteria, as well as agricultural goals. Dissolved iron concentrations were generally below the Central Valley Basin Plan objective. Total manganese levels occasionally exceeded drinking water standards and very rarely exceeded the Agricultural Goal.

As described for Funks Creek, total recoverable mercury measured in Stone Corral Creek did not exceed any criteria. Nickel levels rarely exceeded the Public Health Goal, and nearly half of the samples collected exceeded the aquatic life criterion for total selenium. Total phosphorus levels measured in Stone Corral Creek ranged as high as 450 µg/L during a sampled high flow event. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams.

Tehama-Colusa Canal

The intake for the T-C Canal occurs at the southeast end of the City of Red Bluff at RM 243. The intake occurs downstream from the mouth of Red Bank Creek at the RBDD. The T-C Canal is approximately 111 miles long and extends from Red Bluff in Tehama County to downstream from Dunnigan in Yolo County. Funks Reservoir is approximately 66 canal miles downstream from RBDD.

DWR sampled the T-C Canal downstream from the siphon under Stony Creek. Aluminum levels rarely exceeded criteria for drinking water, aquatic life protection, and the agricultural goal. Arsenic levels exceeded human toxicity criteria during all sampling events, and cadmium levels rarely exceeded human toxicity criteria. Iron levels in the canal occasionally exceeded drinking water standards. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams.

Glenn-Colusa Irrigation District Canal

The intake for the GCID Canal is on a side channel off the Sacramento River at RM 205.5, north of the town of Hamilton City. GCID's Hamilton City pump station, located at the intake, diverts water into the GCID Canal from the Sacramento River for distribution within the GCID service area. The canal is an unlined earthen channel that stretches approximately 65 miles from the system diversion point near Hamilton City to its downstream southern terminus at the CBD near Williams, in Colusa County.

Total aluminum levels in the GCID Canal (GCID Canal at Intake station) frequently exceeded aquatic life criteria during associated high flow conditions in the Sacramento River, and rarely exceeded drinking water criteria and the agricultural goal. Arsenic levels exceeded human toxicity thresholds in all samples collected, and the criterion for protection of aquatic life for cadmium was exceeded in fifty percent of samples collected. Copper levels frequently exceeded hardness-dependent aquatic life protection criteria during high flow conditions in the Sacramento River at the intake to the canal, and iron levels frequently exceeded drinking water and aquatic life protection criteria, as well as the agricultural goal during the same river conditions. Dissolved iron levels exceeded the Central Valley Basin Plan objective occasionally. Mercury levels approached, but did not exceed, the CTR criterion during the highest flow conditions in the river. Manganese levels in the GCID canal occasionally exceeded drinking water standards and the agricultural goal, and lead levels rarely exceeded drinking water criteria. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams.

Colusa Basin Drain

The CBD is a human-made channel located in Glenn, Colusa, and Yolo counties, and was designed to convey agricultural return flows and storm runoff from the Colusa Basin to the Sacramento River at the Knights Landing Outfall Gates at Sacramento RM 34.15. The Colusa Basin includes 32 intermittent streams in the Coast Range Foothills including Funks and Stone Corral creeks.

Aluminum levels in the CBD at Gunners Field station frequently exceeded criteria for the protection of aquatic life, but usually met drinking water and agricultural goals. Similar to all currently monitored sampling sites, arsenic exceeded human toxicity criteria in all samples analyzed from the CBD, and cadmium levels rarely exceeded human toxicity standards. Total iron levels in the CBD frequently exceeded aquatic life and drinking water criteria, with less frequent exceedances of the agricultural goal. Dissolved iron levels occasionally exceeded the level established in the Central Valley Basin Plan during high flows caused by storm runoff. Manganese levels frequently exceeded aquatic life and agricultural goals, as well as drinking water standards to a lesser extent. Total recoverable lead levels analyzed by DWR were found to rarely exceed criteria except for the Public Health Goal, which was exceeded in the CBD. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams.

Sacramento River Opposite Moulton Weir

DWR monitored water quality at the Sacramento River Opposite Moulton Weir station from 2000 to 2010. Total aluminum levels in the Sacramento River at this location frequently exceeded aquatic life criteria during associated high flow conditions in the river, but rarely exceeded drinking water criteria and the agricultural goal. Arsenic levels exceeded human toxicity thresholds in all samples collected, and the criterion for protection of aquatic life for cadmium was occasionally exceeded. Copper levels frequently exceeded hardness-dependent aquatic life protection criteria during high flow conditions in the river, and iron levels frequently exceeded drinking water and aquatic life protection criteria, as well as the agricultural goal during the same river conditions. Dissolved iron levels exceeded the Central Valley Basin Plan level occasionally. Mercury levels approached, but did not exceed, the CTR criterion during the highest flows in the river. Manganese levels occasionally exceeded drinking water standards and the agricultural goal, and lead levels rarely exceeded drinking water criteria. All samples contained total phosphorus at levels at or above the recommended criteria range to prevent nuisance algal growth in streams.

7.3 Environmental Consequences

7.3.1 Regulatory Setting

Water quality is regulated at the federal and State levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

7.3.1.1 *Federal Plans, Policies, and Regulations*

- Clean Water Act
  - Section 303(d) – Total Maximum Daily Load
  - Section 402 – National Pollutant Discharge Elimination System (NPDES) Permit Compliance
  - Section 404 – Discharge of Dredged or Fill Material
- Rivers and Harbors Act Section 10
- Federal Antidegradation Policy
- Federal Safe Drinking Water Act
- Federal Surface Water Treatment Rule
- National Toxics Rule
- Long-Term Management Strategy for the placement of Dredged Material in the San Francisco Bay Region
- Disinfectant and Disinfection Byproducts Rule
- Comprehensive Environmental Response, Compensation and Liability ActFederal Insecticide, Fungicide, and Rodenticide Act and Federal Environmental Pesticide Control Act
- Federal Environmental Protection Agency Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion I

7.3.1.2 *State Plans, Policies, and Regulations*

- Porter-Cologne Water Quality Act
- State Water Resources Control Board Decision 1641 (D-1641)
- Water Quality Control Plan for the Sacramento/San Joaquin River Basins
- San Francisco Bay Basin Water Quality Control Plan
- California Water Code Section 13160
- State Water Resources Control Board Water Rights Decisions, Water Quality Control Plans, and Water Quality Objectives
- California Antidegradation Policy
- Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
- Water Quality Control Plan for the North Coast
- Water Quality Control Plan for the Tulare Basin
- Central Valley RWQCB Drinking Water Policy
- California Toxics Rule
- California Safe Drinking Water Act

7.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for water quality:

Would the Project:

- Violate any water quality standards or waste discharge requirements?
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
- Otherwise substantially degrade water quality?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A violation of any water quality standard or waste discharge requirement, a change in water quality resulting in adverse effects to designated beneficial uses, or otherwise substantially degrade water quality
- A violation of any regulatory temperature criteria or temperature targets

Specifically, the following thresholds were used in the impact evaluation based on the requirements specified in the fourth edition of the water quality control plan (Central Valley Basin Plan) for the Sacramento River and San Joaquin River basins (CVRWQCB, 2011):

- EC threshold of 700 µmhos/cm for agricultural water quality and 900 µmhos/cm for drinking water quality for Extended Study Area service area deliveries
- EC threshold of 230 micromhos/cm (50 percentile) or 235 micromhos/cm (90 percentile) for the Sacramento River upstream of Knights Landing
- EC threshold of 240 micromhos/cm (50 percentile) or 340 micromhos/cm (90 percentile) for the Sacramento River upstream of the I Street Bridge
- Temperature threshold of 56°F in the Sacramento River reach from Keswick Dam to Hamilton City, during periods when temperature increases would be detrimental to the fishery. For the purpose of this analysis, this period was assumed to be from July 1st through November 30th, which is the period of salmonid upstream migration and spawning.
- Temperature threshold of 68°F in the Sacramento River reach from Hamilton City to the I Street Bridge.
- The CVP Operations Criteria and Plan (CVP OCAP) maximum temperature target, as measured at Watt Avenue, of 65°F from July 1st through September 30th (Reclamation 2009).
- A temperature increase of COLD or WARM intrastate waters more than 5°F above natural receiving waters.
- Specific Feather River temperature targets established in a 1983 DFG Agreement to protect the different lifestages of salmonids as measured at the Feather River Fish Hatchery (Fish Barrier Dam):
  - September 1 to September 30 56°F
  - October 1 to May 31 55°F
  - June 1 to August 31 60°F

Impacts to water quality in the Delta are considered significant or potentially significant if they increase salinity, when compared to Existing Conditions to a point that levels would violate D-1641 standards. D-1641 standards specify that salinity shall be controlled on the San Joaquin River at Vernalis to a 30-day mean EC mmhos/cm of 0.7 (700 µmhos/cm) for the irrigation season of April to August and 1.0 EC mmhos/cm (1,000 µmhos/cm) for the non-irrigation season of September to March. D-1641 standards also address the application of the salinity standard to additional downstream compliance locations beginning in April 2005 (Reclamation 2009). These standards are presented in Table 7-1.

Table 7-1
D-1641 EC Standards for the Delta

Water Year Type	Western Delta			
	Sacramento River @ Emmaton		San Joaquin River @ Jersey Point	
	EC 450 µmhos/cm from April 1st to Date Shown 14-Day Mean	EC Value from Date Shown to Aug 15th (µmhos/cm) 14-Day Mean	EC 450 µmhos/cm from April 1st to Date Shown* 14-Day Mean	EC Value from Date Shown to Aug 15th (µmhos/cm) 14-Day Mean
Wet	Aug 15	*	Aug 15	*
Above Normal	Jul 1	630	Aug 15	*
Below Normal	Jun 20	1,140	Jun 20	740
Dry	Jun15	1,670	Jun15	1,350
Critical	*	2,780	*	2,200

*When no date is shown, EC limit continues from April 1st.

If the monthly average X2[9] from implementation of an alternative would increase (i.e., X2 moves east/upstream from the Golden Gate Bridge) relative to the baseline, and would increase the frequency of a violation of the X2 water quality standard, it was considered to be a potentially significant impact. In this analysis, the changes in the monthly average X2 from implementation of an alternative are complex, and often result in improved X2 position and increased estuarine habitat. The potential impact of X2 on aquatic biological resources is addressed in Chapter 12 Aquatic Biological Resources.

Detailed evaluation of the implementation of an alternative was limited in the Suisun Bay, San Pablo Bay, and San Francisco Bay region. Therefore, as a conservative assumption, if the monthly average Delta outflow from implementation of an alternative would decrease by greater than five percent, it was considered to be a potentially significant impact.

7.3.3 Impact Assessment Assumptions and Methodology

7.3.3.1 *Assumptions*

The following assumptions were made regarding Project-related impacts (construction, operation, and maintenance impacts) to water quality:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).

[9] Pursuant to D-1641, X2 is the location of the two parts per thousand salinity contour (isohaline), one meter off the bottom of the estuary, as measured in kilometers upstream from the Golden Gate Bridge. In the 1995 Bay-Delta Plan, an EC value of 2.64 mmhos/cm is used to represent the X2 location.

- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation, increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- All construction activities along the Sacramento River would be conducted during months when instream flows are managed outside of the flood season (e.g., June 15th to September 15th).
- The beneficial uses of the North Coast and Central Valley water bodies included in the Project are as follows: municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), industrial process supply (PRO), navigation (NAV), hydropower generation (POW), water contact recreation (REC-1), non-contact water recreation (REC-2), commercial and sport fishing (COMM), aquaculture (AQUA), warm freshwater habitat (WARM), cold freshwater habitat (COLD), estuarine habitat (EST), wildlife habitat (WILD), preservation of biological habitats of special significance (BIOL), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), and shellfish harvesting (SHELL). The Basin Plans also state that waterbodies within the basins that do not have beneficial uses designated are assigned MUN designations in accordance with the provisions of State Water Board Resolution No. 88-63.

7.3.3.2 *Methodology*

This section describes the approach used to evaluate the surface water quality impacts of the alternatives. Surface water quality was evaluated for the Extended, Secondary, and Primary study areas. Modeling was used to estimate the changes in surface water EC and temperature that would result from implementation of each alternative. EC was used as a surrogate for evaluating other water quality constituents that were not modeled. For the waterbodies where explicit EC or temperature estimates were unavailable, surface water quality impacts were assessed based on modeled changes in flow or storage conditions.

Impact Evaluation Approach

The Extended Study Area represents the regions south of the Delta where Delta exports are used for agricultural, municipal, industrial, and wildlife refuge water supply. The EC values for the Extended Study Area were determined based on the EC and volume of the exports at the Banks and Jones pumping plants. These EC values were estimated using the results from the DSM2 Delta Simulation Model (DSM2 QUAL). The monthly EC summary results at the Banks and Jones pumping plants for an alternative were compared with the appropriate baseline to determine the resulting change. If the monthly average EC was higher from an alternative, when compared to Existing Conditions, the increased level was evaluated against an applicable water quality standard to determine whether the increase in EC exceeded the standard.

The Secondary Study Area is comprised of the waterbodies that could be affected by Project operations. It includes the CVP and SWP storage and conveyance features, reaches of the rivers downstream of the CVP and SWP storage features, the Sacramento-San Joaquin Delta, and the bays. For the Sacramento River at the three potential intakes for Sites Reservoir, worst-case EC values were estimated based on the composition of the water present at the intakes. The origin of the water at each intake was traced to various contributing sources, and the worst-case EC at each intake was estimated based on the worst-case EC estimate of each of the sources, as explained in the EC Mass Balance approach. For the Sacramento-San Joaquin River Delta, the EC values were estimated using the results from the DSM2 QUAL model.

For the locations where EC results are available, monthly EC summary results for each alternative were compared with the appropriate baseline. EC results for the Secondary Study Area are available for the three intake locations along the Sacramento River and the various compliance locations in the Delta. If monthly average EC was found to be higher from an alternative, when compared to the baseline, it was evaluated against an available water quality standard to determine whether the increase in EC exceeded the standard. Impacts to the X2 position in the Delta were determined by comparing the monthly X2 position summary results from the CALSIM II model for each alternative with the appropriate baseline. Impacts to water temperature were determined using USRWQM and Reclamation Temperature Model results for the Trinity, Sacramento, Feather, and American rivers. Initially, the monthly average temperatures were compared for each alternative with the appropriate baseline. If the temperature was found to be higher from an alternative, when compared to the baseline, it was evaluated against an appropriate temperature threshold to determine whether the increase in temperature exceeded that threshold.

The Primary Study Area represents the area within which the Project storage and conveyance facilities would be constructed. The EC values within the Primary Study Area were determined based on the worst-case EC mass balance estimates (described below) at the three potential Sacramento River intakes. For impacts to Sacramento River temperatures downstream of the Delevan Pipeline Intake/Discharge Facilities that would result from Sites Reservoir releases, results from the preliminary Sites Reservoir temperature model were used.

Model results are presented by Water Year Type as defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 2006) for the full 82-year simulation period (water years 1922 through 2003). The different Water Year Types and the percentage of the 82-year simulation period that each type of water year occurred are listed below:

- Wet: 32 percent
- Above Normal: 15 percent
- Below Normal: 17 percent
- Dry: 22 percent
- Critical: 15 percent

EC Mass Balance Approach

Worst-case EC conditions were simulated to assess the maximum potential impact of Project implementation on Sacramento River EC. The analysis included estimation of the worst-case concentrations for various sources along the Sacramento River, as well as the estimation of source water contribution and worst-case concentrations at locations of interest along the Sacramento River. The analysis calculated a simple mass balance using the source concentrations and the percent of source volumes estimated, based on the daily results from USRDOM modeling. The analysis was limited to the three Project proposed intake locations along the Sacramento River (T-C Canal Intake, GCID Canal Intake, and the proposed Delevan Pipeline Intake). The Primary and Secondary study area analyses were formulated using the limited EC field measurements available for various tributaries (sources) and locations along the Sacramento River and assume worst-case EC conditions. The USRDOM model description and results are included in Appendix 6C. The EC Mass Balance Approach description and results are included in Appendix 7C.

DSM2 Delta Simulation Model and CALSIM II CVP and SWP Operations Model

DSM2 is a one-dimensional hydrodynamic and water quality simulation model used to simulate hydrodynamics and water quality in the Sacramento-San Joaquin Delta. DSM2 represents the best available planning model for Delta tidal hydrodynamics and salinity modeling. It is appropriate for describing the existing conditions in the Delta, as well as performing simulations for the assessment of incremental environmental impacts caused by changes in the facilities and operations. The DSM2 model has two separate components: HYDRO and QUAL. The HYDRO module is a one-dimensional, implicit, unsteady, open channel flow model that simulates flows, velocities, and water surface elevations. HYDRO provides the flow input for QUAL. The QUAL module is a one-dimensional water quality transport model that simulates fate and transport of water quality constituents, such as EC, given a flow field simulated by HYDRO. DSM2 QUAL provides EC estimates at various locations in the Sacramento-San Joaquin Delta, including at key salinity control points such as Emmaton, Jersey Point, and at the two export locations at the Banks Pumping Plant and the Jones Pumping Plant. The DSM2 model description and results are included in the Appendix 7D.

DSM2 does not provide all of the water quality information needed for this assessment. The CALSIM II model provides results for the X2 position. Figure 7-1 shows the locations of selected SWRCB D-1641 water compliance stations located in the Delta that were used in this evaluation, including the three stations for defining the X2 standard. Figure 7-1 also includes lines showing the potential range of the X2 location, from 66 km to 95 km from the Golden Gate Bridge, in increments of 5 km.

The X2 position is used along with DSM2 EC results for the assessment of changes in the Sacramento-San Joaquin Delta. The CALSIM II model description and results are included in Appendix 6B. The model results for the X2 position are included in Appendix 6B.

USRWQM and Reclamation Temperature Model

Water temperatures were modeled for major rivers in the Secondary Study Areas to evaluate the thermal impacts of Project operations using the Upper Sacramento River Water Quality Model (USRWQM) and the Reclamation Temperature Model.

USRWQM was developed using the HEC-5Q model to simulate mean daily (using six-hour meteorology) reservoir and river temperatures at Shasta, Trinity, Lewiston, Whiskeytown, Keswick, and Black Butte reservoirs, and the Trinity River, Clear Creek, the upper Sacramento River from Shasta to Knights Landing, and Stony Creek. USRWQM is designed for long-term planning simulations of temperature variability in these the reservoirs and streams, given CVP/SWP Project operations, and allows comparison between existing and assumed future scenarios. Daily flows, simulated in the USRDOM model for an 82-year period (water years 1922 to 2003), are used as input to the USRWQM.

The Reclamation Temperature Model is a reservoir and stream temperature model, which simulates monthly reservoir and stream temperatures used for evaluating the effects of CVP/SWP Project operations on mean monthly water temperatures in the basin. The model simulates temperatures in five major reservoirs (Trinity, Whiskeytown, Shasta, Oroville, and Folsom), four downstream regulating reservoirs (Lewiston, Keswick, Thermalito, and Natoma), and four main river systems (Trinity, Sacramento, lower Feather, and lower American). The reservoir component of the Reclamation Temperature Model calculates temperature changes in main and regulating reservoirs. Using regulating reservoir release temperature as the initial river temperature, the river model computes temperatures at several locations along the rivers. The calculation points for river temperatures generally coincide with tributary inflow locations.

The modeled temperatures used to represent waters in the Secondary Study Area include temperatures from three locations on both the Trinity River and Clear Creek, eight locations on the Sacramento River from Keswick to Freeport, and three locations in both the Feather and Lower American rivers. Sacramento River locations modeled for the Primary Study Area include at Red Bluff, downstream of Red Bluff, downstream of Hamilton City, at Delevan, and downstream of Delevan.

For the Trinity River and Upper Sacramento River locations, where results were available from both the USRWQM and the Reclamation Temperature Model, the results from the USRWQM model were used.

The USRDOM model description and results are included in Appendix 6C. The USRWQM and the Reclamation Temperature Model descriptions and results are included in Appendix 7E.

Sites Reservoir Discharge Temperature Model

- A preliminary Sites Reservoir Discharge Temperature Model was drafted for the temperature analysis of the proposed Sites Reservoir. Only Alternative C was evaluated, based on the assumption that it is the alternative that would result in the worst-case impact to the Sacramento River temperature conditions downstream of the proposed Delevan Pipeline Intake/ Discharge facilities. Therefore, the results from the analysis of Alternative C were assumed to be applicable to the other two action alternatives.
- The physical characteristics and the daily operations of Sites Reservoir, as proposed for Alternative C, were derived from the Alternative C USRDOM simulation. Sites Reservoir inflow temperatures and the Sacramento River temperature targets were derived using the results from the Alternative C USRWQM simulation. Inflow to Sites Reservoir was assumed to be the daily flow from the Holthouse Reservoir Complex to Sites Reservoir, and outflow from Sites Reservoir was specified using daily flow from Sites Reservoir to the Holthouse Reservoir Complex, as simulated in the USRDOM model. Using the information from the USRDOM model ensured that the daily Sites Reservoir operations in the preliminary Sites Reservoir Temperature Model were consistent with the resulting operations from USRDOM and CALSIM II models for Alternative C. Sacramento River temperatures for the location upstream from the proposed Delevan Pipeline Intake/ Discharge facilities were blended with simulated Sites Reservoir release temperatures. The blended temperature was then used to determine whether Sacramento River temperatures would be affected by Sites Reservoir releases. A limitation to this model output is that the potential warming effects from the Project conveyance facilities were not taken into account while computing inflow or release temperatures. However, significant warming is not expected within an underground pipeline.

- The USRDOM model description and results are included in Appendix 6C. The USRWQM and the Reclamation Temperature Model descriptions and results are included in Appendix 7E. The Sites Reservoir Discharge Temperature Model description and results are included in Appendix 7F.

7.3.4 Topics Eliminated from Further Analytical Consideration

Water temperature impacts (Impact SW Qual-2) were not specifically evaluated for agricultural, municipal, industrial, or wildlife refuge water supply within the Extended Study Area, or for San Luis Reservoir and its service areas, because there are no applicable temperature criteria for these beneficial uses.

The following facilities within the Primary Study Area would not store or release water and do not have waterbodies located within their facility footprints; their construction, operation, and maintenance activities would, therefore, have no impact on water temperature (**Impact SW Qual-2**) and are not discussed further: Recreation Areas, Road Relocations and South Bridge, Sites Electrical Switchyard, Field Office Maintenance Yard, Delevan Pipeline Electrical Switchyard, TRR Electrical Switchyard, TRR Pipeline Road, Holthouse Reservoir Electrical Switchyard, Delevan Transmission Line, and the Project Buffer.

7.3.5 Impacts Associated with the No Project/No Action Alternative

7.3.5.1 *Extended Study Area – No Project/No Action Alternative*

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge *Water Use*

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. A comparison of the modeled long-term average EC levels for the No Project/No Action Alternative and Existing Conditions at Clifton Court Forebay indicates that EC levels are expected to decrease (improve) or remain similar in all months. A negligible increase of 0.2 percent in long-term average EC levels is expected to occur in September. Comparing water year type averages, EC levels for the No Project/No Action Alternative are expected to decrease or remain similar to Existing Conditions in most months. Average EC levels for the No Project/No Action Alternative are expected to increase slightly in September during Wet and Above Normal water years (2.6 percent and 1.4 percent, respectively); in September and October during Below Normal water years (1.2 percent and 1.7 percent, respectively); and in July, August, and October in Critical water years (negligible increases). However, these modeled average EC levels are well below the Agricultural Water Quality Goal (Ag Goal) of 700 µmhos/cm, which is protective of various agricultural water uses, including crop irrigation and stock watering (CVRWQCB, 2011). As such, the drinking water goal of 900 µmhos/cm to protect human health would not be exceeded.

Similarly, long-term average EC levels for the No Project/No Action Alternative, when compared to Existing Conditions at the Jones Pumping Plant, are expected to decrease during all months. Water year type averages are expected to decrease or remain similar, with negligible increases expected during a few months of some water year types. Implementation of the No Project/No Action Alternative is expected to reduce the long-term average export-weighted EC, TDS, chloride, and bromide concentrations, when compared to Existing Conditions. Similarly, the Dry and Critical water year type average export-weighted concentrations for the No Project/No Action Alternative would be reduced.

During November, December, and January of Critical water years at Clifton Court Forebay, and during November through March of Critical water years at the Jones Pumping Plant, average EC levels are expected to exceed the Ag Goal. However, the average EC levels associated with Existing Conditions already exceed the goal, and implementation of the No Project/No Action Alternative would decrease those levels. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on EC levels, TDS, bromide, and chloride concentrations associated with agricultural, municipal, industrial, and wildlife refuge water supply.

Central Valley Basin Plan EC criteria only apply to agricultural and drinking water supplies. Other water quality parameters, such as metals and nutrients, were not modeled as part of this analysis. The potential changes to the concentrations of these constituents are unknown at this time. However, the improvements in EC levels for the No Project/No Action Alternative, when compared to Existing Conditions, are expected to translate into improvements of the concentrations of these constituents. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on the concentrations of nutrients, metals, and other water quality constituents (including mercury) associated with agricultural, municipal, industrial, and wildlife refuge water supply.

Regardless of the predicted changes in surface water quality within the Extended Study Area as a result of implementing the No Project/No Action Alternative, the impacts of the projects included in the No Project/No Action Alternative have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to surface water quality have been addressed in those environmental documents.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to adversely impact surface water quality. However, plans for population growth in General Plans would be subject to their own environmental reviews. Therefore, population growth associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on surface water quality.

San Luis Reservoir

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Reservoir surface water level fluctuations can exacerbate nuisance algae blooms when reservoir levels are low due to increased nutrient concentration, reduced reservoir mixing, and higher water temperatures during low storage conditions. With implementation of the No Project/No Action Alternative, San Luis Reservoir would continue to experience water level fluctuations as in the past. Modeled end-of-month long-term average surface water elevations for the No Project/No Action Alternative, when compared to Existing Conditions, indicate slight decreases in elevation during all months. These decreases in surface water elevation fall within the historic range of operation for San Luis Reservoir.

A comparison of water year type averages indicates an increase in elevation of up to 16 feet during April through December in Critical water years and up to 12 feet during April through June in Dry water years resulting from a reduction in South of Delta allocations. Elevations would, therefore, be improved during periods in which algae blooms are a concern. San Luis Reservoir typically experiences dissolved oxygen and algae concerns when storage levels falls below 250,000 acre-feet. End-of-month storage exceedance plots indicate that San Luis Reservoir would have storage levels greater than 250,000 acre-feet during December through May 100 percent of the time for both the No Project/No Action Alternative and Existing Conditions. During June through November, the No Project/No Action Alternative would perform similarly to Existing Conditions. The greatest difference would occur in August, when Existing Conditions would exceed a storage level of 250,000 acre-feet approximately 80.2 percent of the water years, and the No Project/No Action Alternative would exceed the low level approximately 84 percent of the water years. Therefore, water level and storage fluctuations associated with the No Project/No Action Alternative **would not have a substantial adverse effect** on nuisance algae blooms in San Luis Reservoir, when compared to Existing Conditions.

Water quality conditions in San Luis Reservoir depend on Delta exports from the Banks and Jones pumping plants. Refer to the **Impact SW Qual-1** discussion for Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use; it is directly applicable to San Luis Reservoir. Implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on EC levels, TDS, bromide and chloride concentrations, metals, nutrients, and other water quality constituents in the San Luis Reservoir.

7.3.5.2 *Secondary Study Area – No Project/No Action Alternative*

<u>Construction, Operation, and Maintenance Impacts</u>

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, Keswick Reservoir, and Clear Creek -

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Changes in water quality within the Trinity River Basin associated with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, are expected to be negligible and entirely consistent with flow requirements in the Trinity Record of Decision (refer to Section 6.2.2.3 in Chapter 6 Surface Water Resources). Implementation of the No Project/No Action Alternative would result in similar storage conditions in Trinity Lake. Similar storage conditions would not be expected to adversely affect water quality. Consequently, releases from Trinity Lake to the Trinity River would not be expected to adversely impact water quality, and flows from the Trinity River into the Klamath River would not be expected to adversely impact water quality.

With implementation of the No Project/No Action Alternative, Lewiston Lake and Whiskeytown Lake would continue to operate as regulating reservoirs within their historical operational range and would not be expected to adversely impact water quality. Consequently, Whiskeytown Lake releases to Clear Creek would not be expected to adversely impact water quality in Clear Creek. Spring Creek and Keswick Reservoir would also continue to operate within their historical operational range.

Continued operations within the historical range of operation associated with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would, therefore, not have a substantial adverse effect** on water quality in these waterbodies.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Trinity Lake and Lewiston Lake control releases to the Trinity River. Modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in either negligible changes or no change to average monthly Trinity River water temperatures at the Trinity River at North Fork, Trinity River at Douglas City, and Trinity River downstream of Lewiston Dam locations. Consequently, flows from the Trinity River into the Klamath River would be expected to result in negligible changes or no change to Klamath River average monthly water temperatures.

Whiskeytown Lake regulates releases into Clear Creek. Modeling results indicate similar negligible changes to average monthly Clear Creek water temperatures for the Clear Creek at Igo, Clear Creek at Mouth, and Clear Creek downstream of Whiskeytown locations, when compared to Existing Conditions. In addition, Keswick Reservoir would continue to operate as a regulating reservoir. Consequently, flows from Clear Creek and Keswick Reservoir into Spring Creek would be expected to result in negligible changes or no change to Spring Creek average monthly water temperatures.

Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on water temperatures in Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, and Clear Creek.

Shasta Lake

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Water quality conditions within the Shasta Lake basin associated with the No Project/No Action Alternative are expected to be similar to Existing Conditions. Sediment and heavy metal runoff during rain events would continue to impact water quality due to local geology, mining history, and timber harvest land uses. In addition, sediment and nutrient impacts from the Pit River input to the reservoir due to agricultural runoff would continue to occur.

Modeling results indicate that implementation of the No Project/No Action Alternative would result in negligible changes to average end-of-month surface water elevation at Shasta Lake during all months of all water year types, when compared to Existing Conditions. These negligible changes to surface water elevations would not be expected to adversely impact water quality.

Other water quality constituents of concern, including mercury and unknown toxicity on the 303(d) list of impaired waters, were not evaluated explicitly. However, modeling results indicate that implementation of the No Project/No Action Alternative would also result in negligible changes to Shasta Lake average end-of-month storage conditions during all months of all water year types. These negligible changes would not be expected to adversely impact these water quality constituents.

Keswick Reservoir water quality is determined by releases from Shasta Lake. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on Shasta Lake and Keswick Reservoir water quality.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion related to storage conditions. Slight changes to average end-of-month storage would not be expected to result in adverse impacts to water temperature. In addition, modeling results for releases to the Sacramento River downstream of Keswick indicate negligible changes to long-term average monthly temperatures in all months, and negligible changes to average monthly temperature during all months of all water year types.The greatest average change would occur during September of Critical water years, in which temperatures are expected to decrease by 0.6 degree. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on Shasta Lake and Keswick Reservoir water temperature.

Sacramento River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Looking at worst-case EC for the Keswick to Red Bluff reach of the Sacramento River, modeling results for the T-C Canal Intake for the No Project/No Action Alternative indicate that long-term monthly average EC levels are expected to increase slightly during all months, when compared to Existing Conditions, with the greatest increase of 0.8 percent occurring in November. Modeling results indicate that monthly average EC levels by water year type would increase in all months of all water year types, with the exception of negligible decreases in February of Below Normal water years and March of Dry water years. The largest increases of 1.2 percent would occur in November of Dry water years.

Worst-case EC modeling results for the Red Bluff to Hamilton City reach of the Sacramento River, estimated at the GCID Canal Intake, indicate similar results for the No Project/No Action Alternative because slight increases are expected in all months for the long-term average monthly EC, when compared to Existing Conditions, and the greatest increase (0.8 percent) would occur in November. Modeling results for monthly average EC by water year type are also similar, with the greatest increase (1.1 percent) expected to occur in November of Dry water years.

For the GCID Canal Intake to the Delevan Pipeline Intake reach of the Sacramento River, estimated at the Delevan Pipeline, worst-case EC modeling results for the No Project/No Action Alternative show similar trends to the upstream reaches because slight increases in long-term monthly average EC levels are expected during most months, and negligible decreases are expected during February, July, and August, when compared to Existing Conditions. The greatest increase (0.9 percent) is expected to occur in November. Modeling indicates results for monthly average EC by water year type that would be similar, with the greatest increase of 1.2 percent expected to occur in November. Modeling results for worst-case EC levels for the Sacramento River downstream of the Delevan Pipeline are expected to be similar.

Worst-case EC levels for the CBD to the entrance of the Delta at the I Street Bridge reach of the Sacramento River were not estimated explicitly. However, the changes in the EC levels in this reach are expected to trend consistently with the changes described for the upper Sacramento River reaches.

The water year type averages of the worst-case EC values for the No Project/No Action Alternative, in all months, are expected to be below the Central Valley Basin Plan requirement of 230 µmhos/cm for the Sacramento River reach upstream of the CBD. Therefore, these negligible to minor increases in worst-case EC levels on the Sacramento River resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect**, when compared to Existing Conditions.

Other water quality constituents of concern, including mercury and unknown toxicity on the 303(d) list of impaired waters, were not evaluated explicitly. Water quality in the upper reach of the Sacramento River would continue to be generally good. Stormwater-driven runoff would continue to cause occasional elevated levels of mercury, other trace metals, pesticides, and turbidity that would adversely affect water quality in this reach. Water quality in the lower reach of the Sacramento River is expected to be similar to Existing Conditions. Elevated levels of metals and pesticides, turbidity, and pesticide and metal bioaccumulation in fish caused primarily by agriculture return flows from CBD releases near Knights Landing are expected to continue to adversely affect water quality in this reach. However, the changes in the concentrations of the other water quality constituents are expected to be proportional to the changes in the worst-case EC levels for the No Project/No Action Alternative. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on water quality constituents in the Sacramento River, when compared to the Existing Conditions.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Modeling results for the No Project/No Action Alternative indicate negligible changes to long-term average monthly temperatures in all months, and to monthly average temperature during all months of all water year types, for each of the following Sacramento River locations, when compared to Existing Conditions: downstream of Keswick, at Balls Ferry, at Jellys Ferry, at Bend Bridge, at Red Bluff, downstream of Red Bluff, downstream of Hamilton City, at Delevan, downstream of Delevan, and at Knights Landing.

Modeled average monthly temperatures by water year type for the No Project/No Action Alternative indicate that the 56°F criterion for July through October would be exceeded at the following locations on the Sacramento River: downstream of Keswick from August through October in Critical water years; at Balls Ferry from July through October in Critical water years and September in Dry water years; at Jellys Ferry in September in Above Normal, Below Normal, and Dry water years, as well as from July through October in Critical water years; and at Bend Bridge from July through August in Wet water years, August and September in Above Normal, Below Normal, and Dry water years, and July through October in Critical water years.

Modeled average monthly temperatures by water year type for the No Project/No Action Alternative also indicate that the 68°F criterion for July through November would be exceeded at the following Sacramento River locations: at Knights Landing during July and August of all water year types; at Feather River and at American River during July and August in Wet water years, and July through September in Below Normal, Dry, and Critical water years.

Although these criteria temperatures would be exceeded, it is important to note that the criteria temperatures are already exceeded during Existing Conditions at these locations, and implementation of the No Project/No Action Alternative would result in either the same or decreased (improved) temperatures. In some locations during some months, modeling results indicate that the No Project/No Action Alternative could result in increased temperatures, but the expected increase of less than one percent falls within the "noise" of the model and is not considered significant. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on Sacramento River water temperatures.

Lake Oroville, Thermalito Complex, and the Feather River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeling results indicate that implementation of the No Project/No Action Alternative would result in decreased long-term average end-of-month storage conditions at Lake Oroville during all months, when compared to Existing Conditions, with the greatest decrease of 2.8 percent expected to occur in September. Modeling results for average end-of-month storage by water year type indicate decreases in all months of all water year types, with the exception of negligible increases of up to 0.4 percent expected in October and November of Dry water years, and July of Critical water years. These slight decreases in storage conditions would not be expected to have a substantial adverse effect on the water quality of Lake Oroville. The Thermalito Complex would continue to operate as a regulating reservoir system within the historical operational range. Consequently, releases from Lake Oroville and the Thermalito Complex would not be expected to have a substantial adverse effect on the water quality of the Feather River.

Therefore, with implementation of the No Project/No Action Alternative, water quality in the Feather River is expected to continue to be generally good. Some metals and turbidity levels are expected to continue to occasionally exceed Central Valley Basin Plan criteria, mainly during periods of stormwater-driven runoff. Elevated pathogen levels are expected to continue, primarily during the contact recreation season at developed recreation areas. Therefore, water quality impacts to Lake Oroville, the Thermalito Complex, and the Feather River resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect**, when compared to Existing Conditions**.**

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion. Slight decreases in storage conditions at Lake Oroville, and continued operation of the Thermalito Complex as a regulating reservoir system, would not be expected to result in a substantial adverse effect to their water temperatures. In addition, modeling results for long-term average monthly water temperatures and monthly average temperatures by water year type for the Feather River downstream of the Fish Barrier Dam, downstream of Thermalito Afterbay, and at the mouth indicate that implementation of the No Project/No Action Alternative would result in negligible changes, when compared to Existing Conditions. In addition, models indicate that water temperatures at all three Feather River locations would meet the basic Central Valley Basin Plan temperature criteria.

Specific Oroville Facilities temperature targets for the Feather River Fish Hatchery would be exceeded during one or more months in all but Above Normal water year types. Although these criteria temperatures would be exceeded, it is important to note that the criteria are already exceeded during Existing Conditions during these months, and implementation of the No Project/No Action Alternative would result in either the same or decreased temperatures. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on Lake Oroville, Thermalito Complex, and Feather River water temperatures.

Sutter Bypass and Yolo Bypass

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The changes in water quality in the Sutter Bypass and Yolo Bypass were not modeled. However, the changes in the flow spills and flows into these bypasses, respectively, were modeled.

Spills into the Sutter Bypass were modeled at Ord Ferry, Moulton Weir, Colusa Weir, and Tisdale Weir. The modeling of spills was performed at a daily timestep using the USRDOM model. Monthly average exceedance probability plots indicate that spills for the No Project/No Action Alternative would be the same or similar in magnitude and frequency to spills for Existing Conditions at Ord Ferry, Moulton Weir, Colusa Weir and Tisdale Weir.

Spills into the Sutter Bypass from the Sacramento River represent only some of the hydrologic inputs to the lower Sutter Bypass. Large reductions in spill flows can potentially affect the available dilution flows for various water quality constituents. The relationships and interactions of the various hydrologic inputs into the Sutter Bypass and the resulting flow and flooded area in the Sutter Bypass were not modeled. It is not anticipated that the changes in spill exceedance probabilities discussed above would have a substantial impact on surface water quality in the Sutter Bypass. Therefore, it is concluded that the implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on surface water quality, when compared to Existing Conditions.

Spills into the Yolo Bypass at Fremont Weir and Sacramento Weir and resultant flows from the Yolo Bypass into the Sacramento-San Joaquin Delta were modeled at a daily timestep using a specialized module built into the CALSIM II model. Monthly average exceedance probability plots indicate that Yolo Bypass flows for the No Project/No Action Alternative would be the same or similar in magnitude and frequency to flows for Existing Conditions.

It is not anticipated that the described changes in Yolo Bypass flows and outflow would have a substantial impact on surface water quality. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on Yolo Bypass water quality, when compared to Existing Conditions.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperature modeling was not performed for the Sutter Bypass and the Yolo Bypass. However, as described above, the expected changes in spills to the Sutter Bypass represent only a portion of the input to the bypass, and flows into and out of the Yolo Bypass are expected to remain similar. Therefore, it is expected that implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on water temperature in the Sutter Bypass and Yolo Bypass, when compared to Existing Conditions.

Folsom Lake, Lake Natoma, and the American River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled end-of-month storage conditions for the No Project/No Action Alternative for Folsom Lake indicate minor decreases to long-term averages in all months, with the exception of a negligible increase in March, when compared to Existing Conditions. Modeling results for average end-of-month storage by water year type indicate similar minor changes, with the exception of a 6.2 percent decrease in August of Below Normal water years. These slight decreases in storage conditions would not be expected to have a substantial adverse effect on the water quality of Folsom Lake. Lake Natoma would continue to operate as a regulating reservoir system within the historical operational range. Consequently, releases from Folsom Lake and Lake Natoma would not be expected to have a substantial adverse effect on the water quality of the American River.

Therefore, with implementation of the No Project/No Action Alternative, water quality in the American River is expected to continue to be generally good. Elevated levels of pathogens and nutrients would still occur during periods of stormwater-driven urban runoff. Depressed dissolved oxygen levels, pH, and taste and odor issues would continue to occur occasionally during the warm summer months. Permitted municipal and industrial discharges could also affect water quality in the river. Therefore, water quality impacts to Folsom Lake, Lake Natoma, and the American River resulting from implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect.**

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion. Minor decreases to average end-of-month storage conditions at Folsom Lake, and continued operation of Lake Natoma as a regulating reservoir system, associated with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on their water temperatures.

Modeling results for average monthly water temperatures by water year type for the American River downstream of Nimbus Dam, at Watt Avenue, and at the mouth indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in negligible decreases in some months, and minor increases of one degree or less in most months of all water year types.

However, modeling results also indicate that the OCAP temperature target at Watt Avenue would be exceeded during July through September in all but Above Normal water year types. This temperature target is already exceeded during Existing Conditions, but implementation of the No Project/No Action Alternative would increase temperatures by up to 0.9 degree, when compared to Existing Conditions. Exceedance plots indicated that the temperature criteria would be exceeded 100 percent of the years in July and August for both the No Project/No Action Alternative and Existing Conditions, but in September would be exceeded in approximately 91.3 percent of the years during Existing Conditions, and approximately 97.5 percent of the years if the No Project/No Action Alternative is implemented. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would have a potentially substantial adverse effect** on American River water temperatures.

Sacramento-San Joaquin Delta

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in minor changes in average monthly EC during March through November, and moderate decreases during January and February. Modeled average monthly EC results indicate minor changes during all months of Wet and Above Normal water years. Below Normal, Dry, and Critical water years would also experience minor changes in average monthly EC during most months, with the exception of moderate decreases in January and July of Below Normal water years, and January and February of Critical water years. A moderate increase (7.5 percent) is expected to occur in August of Dry water years. Based on these expected monthly averages, D-1641 salinity targets may not be met at this compliance location during August in Wet and Above Normal water years, and during June and August in Dry water years. These salinity targets would already be exceeded during Existing Conditions, and during two of these months, implementation of the No Project/No Action Alternative would reduce the average EC levels. However, average EC levels may be increased above Existing Conditions levels during August in Wet and Dry water years.

To further determine if the increases in average EC levels associated with implementation of the No Project/No Action Alternative during August in Wet and Dry water years would impact compliance with D-1641 salinity standards, exceedance probabilities were examined and compared to those of Existing Conditions. The exceedance plots show that the No Project/No Action Alternative and Existing Conditions would perform similarly because results for both indicate that monthly average EC in August would exceed the 450 µmhos/cm Wet water year standard approximately 96 percent of the years. However, monthly Average EC in August would exceed the 1,670 µmhos/cm Dry water year standard approximately 17 percent of the years with implementation of the No Project/No Action Alternative, and the 1,670 µmhos/cm standard would be exceeded approximately 13 percent of the years during Existing Conditions. Therefore, implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on average monthly EC levels in the Delta due to changes at the Sacramento River at Emmaton compliance location.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in decreases of up to 6.2 percent in average monthly EC levels during all months. Modeled average monthly EC results indicate minor increases from August through December in Wet and Above Normal water years, in September and October in Below Normal water years, and in April through June in Critical water years. Based on these expected monthly averages, D-1641 salinity targets may not be met at this compliance location during August in Wet, Above Normal, and Dry water years; and during July and August in Below Normal water years. These salinity targets are also exceeded during Existing Conditions, and during several of these months, implementation of the No Project/No Action Alternative would reduce EC levels. However, EC levels would be increased above Existing Conditions levels during August in Wet and Above Normal water years.

To further determine if the increases in average EC levels associated with implementation of the No Project/No Action Alternative during August in Wet and Above Normal water years would impact compliance with D-1641 salinity standards, exceedance probabilities were examined and compared to those of Existing Conditions. The exceedance plots show that the No Project/No Action Alternative and Existing Conditions would perform similarly because results for both indicate that monthly average EC in August would exceed the 450 µmhos/cm Wet and Above Normal water year standard in approximately 96 percent of the years. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on average monthly EC levels in the Delta due to changes at the San Joaquin River at Jersey Point compliance location.

EC is a good indicator of other water quality constituents in the Delta. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on the other water quality constituents in the Delta.

Modeling results for long-term average monthly X2 position indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in an eastward movement of X2 by up to 0.2 kilometer (km) in April through June, and either no change or a westward movement of up to 0.1 km in July through March. Modeling results for average monthly X2 position indicate that, in Wet water years, X2 would move eastward by up to 0.2 km in all months, with the exception of March when X2 would move westward by 0.1 km. During Above Normal water years, X2 would move eastward by up to 0.3 km in April and May, and would experience either no change or move westward up to 0.2 km in June through March. During Below Normal water years, X2 would move eastward by up to 0.3 km in April and May, as well as in October through December, and would experience either no change or move westward by up to 0.5 km in the remaining months. During Dry water years, X2 would move eastward up to 0.2 km in March through May, and would experience either no change or move westward up to 0.3 km June through February. During Critical water years, X2 would move eastward in April and May by 0.2 km, and would experience either no change or move westward by up to 0.5 km.

The small eastward movements indicated during the February through June and September through November D-1641 compliance periods for the No Project/No Action Alternative, when compared to Existing Conditions, have the potential to move the X2 position out of compliance. However, a comparison of exceedance probabilities for all years indicates that the No Project/No Action Alternative would perform similarly to Existing Conditions during February through June, and would perform the same as Existing Conditions during September through November. Therefore, these slight changes in X2 position associated with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on X2 position compliance.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for the Delta, and there are no specific water temperature criteria in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB, 2006). However, water temperatures in the Delta approach equilibrium temperatures where the meteorological conditions primarily influence the water temperatures. Thus, the differences between the No Project/No Action Alternative and Existing Conditions would be minimized. Therefore, implementation of No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on water temperature in the Delta.

Suisun Bay, San Pablo Bay, San Francisco Bay

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Model simulations for Delta outflow indicate that implementation of the No Project/No Action Alternative would result in minor decreases in average monthly outflow during most months of Wet, Above Normal, and Below Normal water year types, when compared to Existing Conditions. Delta outflow would experience minor increases and decreases during Dry and Critical water years. The largest decreases are expected to occur in August of Wet water years (-5.3 percent) and October of Below Normal water years (-5.0 percent). The decrease in outflow of 5 percent during Below Normal water years could have an adverse effect on water quality in the bays. Therefore, implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on water quality in the bays, when compared to Existing Conditions.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for Suisun Bay, San Pablo Bay, or San Francisco Bay, and there are no specific water temperature criteria in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB, 2006). Based on the seasonal flow changes described above with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, and because the temperatures in the Suisun Bay, San Pablo Bay, and San Francisco Bay are primarily controlled by the meteorological conditions, **there would not be a substantial adverse effect** on water temperature.

7.3.5.3 *Primary Study Area – No Project/No Action Alternative*

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

With implementation of the No Project/No Action Alternative, the proposed Project would not be constructed; additionally, none of the 14 projects included in the No Project/No Action Alternative would occur within the Primary Study Area. Therefore, surface water quality conditions in local creeks within the Primary Study Area are expected to remain similar to Existing Conditions.

Modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in changes of up to 0.8 percent in long-term average monthly EC levels during all months at Funks Reservoir. Modeling indicates results for average monthly EC levels that would be similar during all months of all water year types, with the greatest increase of 1.2 percent occurring in November of Dry water years. No specific EC threshold exists for Funks Reservoir; these modeling results are presented to provide a base of comparison for the with-Project alternative evaluations.

Similarly, modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in changes of up to 0.8 percent in long-term average monthly EC levels during all months at the T-C Canal intake location. Modeling indicates that results for average monthly EC levels would be similar during all months of all water year types, with the greatest increase of 1.2 percent occurring in November of Dry water years. Modeling indicates that results would be similar for long-term average and average monthly EC levels at the GCID Canal intake location, as well as at and downstream of the proposed Delevan Pipeline intake location, which is discussed for the No Project/No Action Alternative to provide a base of comparison for the with-Project alternative evaluations. The modeled average monthly EC values would not exceed the EC threshold of 230 micromhos/cm for the Sacramento River upstream of Knights Landing. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on EC levels within the Primary Study Area.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Funks Reservoir water temperature was not modeled. However, because this facility would continue to act as a regulating reservoir within its historical operational range, implementation of the No Project/No Action Alternative **would not have a a substantial adverse effect** on Funks Reservoir water temperature, when compared to Existing Conditions.

Modeled Sacramento River water temperatures for the existing T-C Canal intake (Sacramento River at and downstream of Red Bluff) and GCID Canal intake (Sacramento River downstream of Hamilton City) indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in either no change or negligible changes in average monthly temperature during all months of all water year types at these locations. Modeling indicates that results would be similar at and downstream of the location of the Delevan Pipeline Intake Facilities.

Although the specific temperature criteria of 56°F would be exceeded during several months in most water year types, the criteria is already exceeded during Existing Conditions, and implementation of the No Project/No Action Alternative would not make conditions worse. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on water temperatures within the Primary Study Area, when compared to Existing Conditions.

7.3.6 Impacts Associated with Alternative A

7.3.6.1 *Extended Study Area – Alternative A*

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Comparison of the modeled long-term average EC levels for Alternative A and Existing Conditions at Clifton Court Forebay indicates that EC levels are expected to decrease or remain similar in all months. Comparing water year type averages, EC levels for Alternative A are expected to decrease or remain similar in nearly all months of all water year types. Negligible increases of up to 2.6 percent are expected primarily in September of Wet, Above Normal, and Below Normal water years, and October of Below Normal water years. The modeled long-term average and water year type average EC levels at the Jones Pumping Plant if Alternative A is implemented are also expected to be lower or similar to Existing Conditions in all months.

Comparison of the modeled long-term average EC levels for Alternative A and the No Project/No Action Alternative at Clifton Court Forebay indicates that EC levels are expected to decrease or remain similar in all months. Negligible increases of up to 0.8 percent in the long-term average EC are expected to occur in December, April, and May. Comparing water year type averages, EC levels with implementation of Alternative A are again expected to be lower than or similar to the No Project/No Action Alternative in most months. In July and November of Above Normal water years, the average EC with Alternative A would increase by 6.5 percent and 6.1 percent, respectively. Further, negligible increases are expected in the winter, spring, and summer months of all water year types. The modeled long-term average and water year type average EC levels at the Jones Pumping Plant with implementation of Alternative A are also expected to be lower or similar to the No Project/No Action Alternative in most months. Negligible increases of up to 4.5 percent in EC levels are expected at the Jones Pumping Plant in a few months with implementation of Alternative A, when compared to the No Project/No Action Alternative.

Alternative A is expected to reduce the long-term average export-weighted EC, TDS, chloride, and bromide concentrations, when compared to Existing Conditions and the No Project/No Action Alternative. Similarly, the Dry and Critical water year average export-weighted concentrations are expected to decrease with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

Although minor increases in EC levels are expected with implementation of Alternative A, the largest of all the increases are expected to occur in July and November during Above Normal water years, which have relatively wetter conditions. The resulting EC levels for Above Normal water years are expected to remain below water quality standards. Other increases in EC levels are indicated in other water year types, but the modeled EC levels are expected to remain below the Ag Goal of 700 µmhos/cm during April through August, and 1,000 µmhos/cm during September through March, which is protective of various agricultural water uses, including crop irrigation and stock watering (CVRWQCB, 2011). Consequently, EC levels are also expected to remain below the drinking water goal of 900 µmhos/cm to protect human health. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on EC levels, TDS, bromide, and chloride concentrations associated with agricultural, municipal, industrial, and wildlife refuge water supply.

Central Valley Basin Plan EC criteria apply only to agricultural and drinking water supplies. Other water quality parameters, such as metals and nutrients, were not modeled as part of this analysis. The potential changes to the concentrations of these constituents are unknown at this time. However, the improvements in EC levels with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, are expected to translate into improvements in the concentrations of these constituents. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the concentrations of nutrients, metals, and other water quality constituents, including mercury, associated with the deliveries for agricultural, municipal, industrial, and wildlife refuge use.

San Luis Reservoir

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

With implementation of Alternative A, San Luis Reservoir would continue to experience water level fluctuations as it currently does. Modeled end-of-month long-term average surface water elevations for

Alternative A, when compared to Existing Conditions, indicate minor decreases of up to six feet in elevation in June through October. These decreases in surface water elevation fall within the historic range of operation for San Luis Reservoir. A comparison of water year type averages indicates an increase in elevation of up to seven feet during all months of Below Normal water years, and up to twelve feet during all months in Critical water years. During Dry water years, increases of up to eight feet are expected in January through June. Elevations would, therefore, be improved during periods in which algae blooms are a concern, with the exception of decreases of up to twelve feet in July through December of Dry water years.

Modeled end-of-month long-term average surface water elevations for Alternative A, when compared to the No Project/No Action Alternative, indicate minor decreases of up to three feet during June through August. These decreases in surface water elevation also fall within the historic range of operation for San Luis Reservoir. A comparison of water year type averages indicates an increase of up to eleven feet in all months of Below Normal water years. Elevations are expected to decrease up to 13 feet in all months in Dry and Critical water years.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet 100 percent of the years in December through May with both Alternative A and the No Project/No Action Alternative, and that Alternative A would perform similarly to the No Project/No Action Alternative in June through November.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet 100 percent of the years in December through May with both Alternative A and Existing Conditions. Alternative A would perform similarly to Existing Conditions in August through November. In June, Existing Conditions would exceed 250,000 acre-feet approximately 87 percent of the years, and Alternative A would exceed 250,000 acre-feet approximately 91 percent of the years. In July, Existing Conditions would exceed 250,000 acre-feet approximately 80 percent of the years, and Alternative A would exceed 250,000 acre-feet approximately 85 percent of the years.

Even with the expected decreases in surface water elevations associated with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, the end-of-month storage exceedances of 250,000 acre-feet would be similar or improved with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, operational changes at San Luis Reservoir would be expected to have a less-than-significant impact on nuisance algae blooms, when compared to Existing Conditions and the No Project/No Action Alternative.

Water quality conditions in the San Luis Reservoir depend on the Delta exports from the Banks and Jones pumping plants. Refer to **Impact SW Qual-1** for the Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use, which are directly applicable to San Luis Reservoir. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on EC levels, TDS, bromide, and chloride concentrations, metals, nutrients, and other water quality constituents in the San Luis Reservoir.

7.3.6.2 *Secondary Study Area – Alternative A*

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, Keswick Reservoir and Clear Creek

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would result in improved long-term average end-of-month storage conditions in Trinity Lake during all months. Average end-of-month storage by water year types is also expected to increase, with the largest increases of up to 16.1 percent expected to occur in Critical water years. Improved storage conditions would not be expected to adversely affect water quality, and would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Consequently, releases from Trinity Lake to the Trinity River would not be expected to adversely impact water quality, nor would flows from the Trinity River into the Klamath River. Impacts to water quality would, therefore, be **less than significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

With implementation of Alternative A, Lewiston Lake and Whiskeytown Lake would continue to operate as regulating reservoirs within their historical operational range, and would not be expected to adversely impact water quality. They would, therefore, have a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. Consequently, Whiskeytown Lake releases to Clear Creek would not be expected to adversely impact water quality in Clear Creek, and would, therefore, be **less than significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

Spring Creek and Keswick Reservoir would also continue to operate within their historical operational ranges; therefore, water quality conditions in these waters from implementation of Alternative A would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Modeled water temperature results indicate that implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would result in negligible changes to average monthly water temperature on the Trinity River at North Fork, Trinity River at Douglas City, and Trinity River downstream of Lewiston Dam locations. Consequently, flows from the Trinity River into the Klamath River would be expected to result in negligible changes or no change to Klamath River average monthly water temperatures.

Modeling results for Alternative A also indicate negligible changes to the average monthly water temperatures for the Clear Creek at Igo, Clear Creek at Mouth, and Clear Creek downstream of Whiskeytown locations, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, Keswick Reservoir would continue to operate as a regulating reservoir. Consequently, flows from Clear Creek into Spring Creek would be expected to result in negligible changes or no change to Spring Creek average monthly water temperatures.

Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on water temperatures in Trinity Lake, Lewiston Lake, the Trinity River, Klamath River downstream from Trinity River, Whiskeytown Lake, Spring Creek, Keswick Reservoir, and Clear Creek.

Shasta Lake

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeling results indicate that implementation of Alternative A, when compared to Existing Conditions, would result in increased long-term average end-of-month storage at Shasta Lake during all months, with the exception of a negligible decrease expected during February. Modeling indicates that results for average end-of-month storage by water year type would be similar, with increased storage of up to 14.3 percent expected in all months of Critical water years. Modeling indicates that results would be similar for Alternative A, when compared to the No Project/No Action Alternative. Increased end-of-month storage would not be expected to adversely impact water quality.

Other water quality constituents of concern, including mercury and unknown toxicity, were not evaluated explicitly. However, because the Shasta Lake storage conditions are expected to improve with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, it is expected that the water quality would not be adversely impacted.

Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on Shasta Lake water quality.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion. Improved storage conditions in Shasta Lake, with implementation of Alternative A, are expected to result in improved temperature conditions. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on water temperatures in Shasta Lake.

Sacramento River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

For the Keswick to Red Bluff reach of the Sacramento River, worst-case EC modeling results estimated at the T-C Canal Intake with implementation of Alternative A are expected to remain similar in most months of all water year types, when compared to Existing Conditions and the No Project/No Action Alternative. There is an expected increase of up to 0.4 percent in Wet water years to 2.7 percent in Critical water years in the April EC levels at the Red Bluff location, due to the reduction in the flow released from Shasta Lake to meet downstream requirements.

Similarly, for the Red Bluff to Hamilton City reach of the Sacramento River, worst-case EC modeling results estimated at the GCID Canal Intake are expected to decrease in most months if Alternative A is implemented, when compared to Existing Conditions and the No Project/No Action Alternative. A small increase of 0.6 percent in Wet water years to 3.4 percent in Critical water years is expected to occur in

March and April, and up to 1.4 percent in some of the fall months if Alternative A is implemented, when compared to Existing Conditions and No Project/No Action Alternative, due to the reduction in the Shasta release and the increased diversions at the T-C Canal Intake. For the Sacramento River reach between the GCID Canal Intake and the Delevan Pipeline Intake, worst-case EC modeling results indicate similar trends to the upstream reaches, when Alternative A is compared to Existing Conditions and the No Project/No Action Alternative. The worst-case EC levels with Alternative A upstream of the Delevan Pipeline Intake show minor increases in March of up to 1.8 percent and April of up to 5.6 percent, and up to 2.7 percent in some fall months. These increased EC levels would result from the reduction in Shasta releases and increased diversions at both the T-C Canal and GCID Canal intakes to fill Sites Reservoir.

Downstream of the Delevan Pipeline, worst-case EC levels in the Sacramento River are expected to increase in most months of all water year types with implementation of Alternative A when compared to Existing Conditions and the No Project/No Action Alternative. The largest of the increases are expected in April (up to 5.3 percent) and in the fall months (up to 5.9 percent). Small increases are also expected in some winter, spring, and summer months in all water year types.

The EC levels for the Sacramento River reach from the CBD to the entrance of the Delta at the I Street Bridge were not estimated explicitly. However, the changes in the EC levels in this reach are expected to trend consistently with the changes found in the upper Sacramento River reaches.

Increased EC levels with implementation of Alternative A would result from reductions in the flows released from Shasta Lake. Further, in the winter and spring months, increased diversions at the three intakes to fill Sites Reservoir would contribute to increased EC levels in the Sacramento River. In the summer and fall months, releases from Sites Reservoir would also cause EC levels to increase in the Sacramento River reach downstream of the Delevan Pipeline. Despite these increases, the water year type averages of the worst-case EC values with Alternative A, in all months, are expected to be below the Central Valley Basin Plan requirement of 230 μmhos/cm for the Sacramento River reach upstream of the CBD.

Therefore, the minor increases in the worst-case EC levels are considered negligible, and the impacts to Sacramento River EC levels due to the implementation of Alternative A would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality constituents of concern, including mercury and unknown toxicity on the 303(d) list of impaired waters, were not evaluated explicitly. However, the changes in the concentrations of the other water quality constituents are expected to be proportional to the changes in the worst-case EC levels with Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, the impact on other water quality constituents in the Sacramento River due to the implementation of Alternative A would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Implementation of Alternative A would allow Shasta Dam water releases with temperatures within an acceptable range, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and life stages of anadromous salmonids in the Sacramento River between Keswick Dam and RBDD, with particular emphasis on the months of the highest potential water temperature-related impacts (i.e., July through October) during Below Normal, Dry, and Critical water year types.

For the Sacramento River reach between Keswick and Bend Bridge, comparison of temperature results for Alternative A with Existing Conditions and the No Project/No Action Alternative indicates similar or decreased water temperatures in summer and fall months of Below Normal, Dry, and Critical water years when the ambient temperatures are higher. In the winter and spring months (December through May) when the ambient temperatures are lower, Alternative A results indicate similar or slightly elevated water temperatures of up to 1.7 percent in all water years, and in the summer months of Wet and Above Normal water years. Modeled average monthly temperatures by water year type for Alternative A indicate that the 56°F criterion for July through October would be exceeded in this Sacramento River reach during some months of Below Normal, Dry, and/or Critical water years. Although this criterion temperature would be exceeded, it is important to note that the criterion is already exceeded with Existing Conditions and the No Project/No Action Alternative at these locations, and implementation of Alternative A would result in decreased temperatures relative to Existing Conditions and the No Project/No Action Alternative.

For the Sacramento River downstream of the GCID Canal Intake near Hamilton City, water temperatures with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, are expected to be similar or lower in summer and fall months of Dry and Critical water years and in fall months of Below Normal water years when the ambient temperatures are higher. Similar or slightly elevated water temperatures are expected in winter and spring months (December through May) of up to 1.7 percent in all water years, and in the summer months of Wet, Above Normal, and Below Normal water years, when the ambient temperatures are low.

For the reach upstream of the Delevan Pipeline, the changes in water temperatures would be consistent with Hamilton City. Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates similar or lower water temperatures in summer and fall months of Below Normal, Dry, and Critical water years when the ambient temperatures are higher. Similar or slightly elevated water temperatures are expected in winter and spring months (December through May) of up to 1.4 percent in all water years, and in the summer months of Wet and Above Normal water years, when the ambient temperatures are low.

Downstream of Delevan Pipeline, water temperatures in the Sacramento River may be affected by releases from Sites Reservoir. The results from preliminary temperature modeling of Sites Reservoir performed for Alternative C (Alternative C was assumed to show the worst-case conditions) indicate that in approximately 98 percent of the months, Sites Reservoir releases would be within 0.5°F of the receiving Sacramento River water temperatures. Even though the model indicates a small number of months (less than five percent) with a likely cooling impact of 0.2°F or more, the Sites Reservoir temperature results showed that it is possible to avoid such impacts by releasing from appropriate outlets. Only one month showed a cooling of more than 1°F in the 82-year simulation period. In a few years, mainly in an extended drought period when both Sites Reservoir storage and Sacramento River flow upstream of Delevan Pipeline would be low, releases from Sites Reservoir are likely to cause warming of the receiving Sacramento River waters. In less than one percent of the months, the temperatures in the Sacramento River downstream of the Delevan Pipeline are expected to increase by 1°F or more due to releases from Sites Reservoir. There are approximately five percent of the months with a likely warming impact of 0.2°F or more, although most of the months are within the same year. The warming impact is mainly found during September and October. Therefore, changes in water temperature in the Sacramento River downstream of Delevan Pipeline with implementation of Alternative A would remain consistent with the changes observed upstream of Delevan Pipeline, when compared to Existing Conditions and the No Project/No Action Alternative.

Water temperatures in the Sacramento River reach from the Feather River confluence to the I Street Bridge near the Delta approach equilibrium temperatures where the meteorological conditions primarily influence the water temperatures. Thus, the differences between Alternative A and Existing Conditions and the No Project/No Action Alternative would be minimized. Comparison of the average water temperatures for Alternative A to Existing Conditions and the No Project/No Action Alternative at the Freeport location indicates that the temperatures are expected to be similar or lower in summer and fall months of all water years. Typically, this is when the ambient temperatures are higher.

For the winter and spring months (December through May) when the ambient temperatures are low, the resulting average temperatures with implementation of Alternative A are expected to be slightly elevated by up to 0.5 percent in all water years, when compared to Existing Conditions and the No Project/No Action Alternative. Modeled average monthly temperatures by water year type for Alternative A indicate that the 68°F criterion for July through November from Hamilton City to the I Street Bridge would be exceeded at Knights Landing during some months of all water years, and at the Feather River and American River during some months of Below Normal, Dry, and Critical water years. However, it is important to note that the criterion is already exceeded with Existing Conditions and the No Project/No Action Alternative at these locations, and implementation of Alternative A would result in decreased temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

Based on the above model observations, implementation of Alternative A would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative for Sacramento River temperatures in the reach between Keswick and the I Street Bridge.

Pump Installation at the Red Bluff Pumping Plant

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Alternative A includes the installation of one pump into an existing concrete bay at the Red Bluff Pumping Plant. Operations and maintenance of this facility would include occasional dredging of the forebay to maintain design flow capacity. Pump installation and associated maintenance would occur during the annual maintenance period for the T-C Canal and would not result in sediment discharge. These activities are, therefore, expected to have a **less-than-significant impact** to EC levels and other water quality constituents in the Sacramento River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Installation of the pump would not affect the water temperatures in the Sacramento River. Modeling results indicate that operation of this pump, as part of Alternative A, would result in similar or lower temperatures in summer and fall months of Below Normal, Dry, and Critical water years when the ambient temperatures are higher. In the winter and spring months (December through May) water temperatures would be similar or slightly elevated by up to 1.7 percent in all water years, and in the summer months of Wet and Above Normal water years, when the ambient temperatures are low. Therefore, installation of a pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on Sacramento River water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

Lake Oroville, Thermalito Complex, and Feather River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeling results indicate that implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would result in increased long-term average end-of-month storage at Lake Oroville in December through July, and decreased storage by up to 2.1 percent in September through November. Modeling results for average end-of-month storage indicate increases during all months of Below Normal and Critical water years, and increases in all months with the exception of minor decreases in January, February, and September in Dry water years. These overall improved storage conditions at Lake Oroville resulting from implementation of Alternative A, when compared to Existing Conditions and the No Project/no Action Alternative, would not adversely affect water quality conditions. The Thermalito Complex would continue to operate as a regulating reservoir system within its historical operational range. Consequently, releases from Lake Oroville and the Thermalito Complex would not be expected to have an adverse affect on Feather River water quality. Therefore, water quality impacts to these waters resulting from implementation of Alternative A would be **less than significant,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion. Improved storage conditions in Lake Oroville would result in similar or lower temperatures, when compared to Existing Conditions and the No Project/No Action Alternative, and would therefore have a **less-than-significant impact** on water temperature in Lake Oroville.

The Thermalito Complex would continue to operate as a regulating reservoir within the historical operational range; implementation of Alternative A would, therefore, have a **less-than-significant impact** on its water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative. Modeled water temperatures for the Feather River for Alternative A indicate overall decreases, with some negligible increases in water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative. Alternative A would result in similar or lower average water temperatures at the fish barrier in the low flow channel and in the high flow channel from Thermalito to the confluence of the Sacramento River in September of all water years, when compared to Existing Conditions and the No Project/No Action Alternative. In other months, there would be minor fluctuations in average water temperatures with Alternative A, with the elevated temperatures representing less than 0.8 percent in all water years. Specific Oroville Facilities temperature targets for the Feather River Fish Hatchery would be exceeded during one or more months in Below Normal, Dry, and Critical water years. Although these criteria temperatures would be exceeded, it is important to note that the criteria are already exceeded for Existing Conditions during these months, and implementation of the Alternative A would result in either the same or decreased temperatures. These slight changes in water temperatures on the Feather River resulting from implementation of Alternative A would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sutter Bypass and Yolo Bypass

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Alternative A would be operated to divert excess Sacramento River flows from November through March to fill Sites Reservoir. During these months, this operational scenario would potentially reduce flows by up to 5,900 cfs (the total maximum diversion possible at the three intakes for Sites Reservoir) in the Sutter and Yolo bypasses. Changes in operations associated with integrated operations of Sites Reservoir with Shasta Lake may also influence the frequency and magnitude of flows in the Sutter and Yolo bypasses.

Spills into the Sutter Bypass were modeled at Ord Ferry, Moulton Weir, Colusa Weir, and Tisdale Weir. The modeling of spills was performed at a daily time-step using the USRDOM model. Monthly average exceedance probability plots indicate that spills for Alternative A would be the same or similar in frequency of spills for Existing Conditions at Ord Ferry, Moulton Weir, and Colusa Weir. Exceedance probability plots for Alternative A, when compared to the No Project/No Action Alternative would be similar in frequency of spills.

Of the four weirs, Tisdale Weir spills at the lowest flow rate, when flow in the Sacramento River exceeds approximately 23,500 cfs. Colusa Weir spills when flow in the Sacramento River exceeds approximately 30,000 cfs. Ord Ferry and Moulton Weir do not spill until flow in the Sacramento River is 70,000 cfs or higher. The changes in spills for Alternative A, when compared to Existing Conditions, vary from minor increases to decreases during high flow months when the weirs are spilling. Though the overall frequency of spills is similar, the long-term average volume of spill for Alternative A, when compared to Existing Conditions, decreases by approximately five percent at Tisdale Weir and three percent at Colusa Weir, generally in the period of December through March. Exceedance probability plots for Alternative A, when compared to the No Project/No Action Alternative, show similar decreases in the volume of spills.

Spills into the Sutter Bypass from the Sacramento River represent only some of the hydrologic inputs to the lower Sutter Bypass. Large reductions in spill flows can potentially affect the available dilution flows for various water quality constituents. The relationships and interactions of the various hydrologic inputs into the Sutter Bypass and the resulting flow and flooded area in the Sutter Bypass were not modeled. It is not anticipated that the changes in spill exceedance probabilities discussed above would have a substantial impact on surface water quality in the Sutter Bypass. Therefore, it is concluded that implementation of Alternative A would result in a **less-than-significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Spills into the Yolo Bypass at Fremont Weir and Sacramento Weir and resultant flows from the Yolo Bypass into the Sacramento-San Joaquin Delta were modeled at a daily time-step using a specialized module built into the CALSIM II model. Monthly average exceedance probability plots of Yolo Bypass flows with Alternative A, when compared to Existing Conditions, indicate lower or similar exceedance probabilities, and lower long-term average flows by approximately five percent, generally in the period of December through March. It is not anticipated that the described changes in Yolo Bypass flows and outflow would have a substantial impact on surface water quality. Therefore, water quality impacts to the Yolo Bypass resulting from implementation of Alternative A would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperature modeling was not performed for the Sutter Bypass and the Yolo Bypass. However, as described above, the expected changes in spills to the Sutter Bypass represent only a portion of the input to the bypass, and flows into and out of the Yolo Bypass are expected to decrease slightly. Therefore, it is anticipated that implementation of Alternative A would have a **less-than-significant impact** on water temperature in the Sutter Bypass and Yolo Bypass, when compared to Existing Conditions and the No Project/No Action Alternative.

Folsom Lake, Lake Natoma, and American River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled long-term average end-of-month storage for Alternative A for Folsom Lake, when compared to Existing Conditions and the No Project/No Action Alternative, indicate increased storage during all months, with the exception of a negligible decrease expected to occur in June. Average end-of-month storage results indicate similar conditions in Wet, Above Normal, and Dry water years. Negligible decreases are expected in September through January and April through June of Below Normal water years, and in August through October in Critical water years. Overall improved storage conditions in Folsom Reservoir associated with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would not be expected to adversely affect water quality. Lake Natoma would continue to operate as a regulating reservoir within its historical operational range. Thus, the changes in water quality in the two reservoirs would be negligible. Consequently, releases from Folsom Lake and Lake Natoma would not be expected to have a substantial adverse effect the water quality of the American River. Therefore, water quality impacts to these waters resulting from implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would be **less than significant.**

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-1** discussion. Increased Folsom Reservoir storage conditions and continued operation of Lake Natoma as a regulating reservoir system with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would not result in adverse impacts to their water temperatures. Therefore, the impact to water temperature at Folsom Lake and Lake Natoma would be **less than significant.**

Modeled water temperatures for the American River downstream of Nimbus Dam, at Watt Avenue, and at the mouth for Alternative A indicate that the average monthly temperatures are expected to increase in June through November in all water years, with the exception of Critical water years, by up to 1.9 percent, when compared to Existing Conditions. These months typically have warmer water temperatures and any increase can cause an adverse effect. The indicated increases would exceed the July through September temperature target at Watt Avenue during all water years except Above Normal. However, this apparent increase in temperature is actually a result of increased American River demands and the change in operations occurring with the No Project/No Action Alternative; these adverse changes are carried forward into Alternative A, but are not associated with implementation of Alternative A.

In addition, implementation of Alternative A would result in slightly decreased temperatures in July through September during Critical water years. Therefore, the impact to American River water temperatures resulting from implementation of Alternative A is considered to be **less than significant,** when compared to Existing Conditions. When the modeled water temperatures for the American River downstream of Nimbus Dam, at Watt Avenue, and at the mouth with implementation of Alternative A are compared to the No Project/No Action Alternative, the average monthly water temperatures are found to be similar in all months during all water year types. One exception is that the average monthly temperatures with implementation of Alternative A are expected to increase in July in Above Normal water years by 0.6 percent and in Below Normal water years by 1.8 percent. The increase would not exceed the July through September temperature target at Watt Avenue during Above Normal water years, but would exceed it during Below Normal water years. To verify if the expected minor increases in temperature with implementation of Alternative A would impact compliance with the Watt Avenue temperature target, exceedance probability plots were evaluated and compared to those of the No Project/No Action Alternative. In all three months, Alternative A would perform the same as the No Project/No Action Alternative. Overall, implementation of Alternative A would result in negligible changes to American River water temperatures, and therefore, would result in a **less-than-significant impact**, when compared to the No Project/No Action Alternative.

Sacramento-San Joaquin Delta

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicates that implementation of Alternative A, when compared to Existing Conditions, would result in similar or lower EC levels during June through January, and a slightly elevated EC levels during February through May (up to 1.3 percent). Modeled water year type average monthly EC values indicate similar trends, with increased EC during February through May, and decreased EC in other months.

The largest average EC increase is expected to occur in February in Critical water years when EC is expected to increase by 10.7 percent from approximately 459 µmhos/cm with Existing Conditions to approximately 508 µmhos/cm with Alternative A. February through May months typically have lower EC levels in the Delta because of the high natural runoff from the upstream watersheds and less salinity intrusion from the San Francisco Bay.

To verify if the minor increases in average EC levels expected in the April and May months with implementation of Alternative A would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that monthly average EC in April would exceed the 450 µmhos/cm Wet water year standard less than five percent of the years with Alternative A and Existing Conditions. Similarly, the monthly average EC in April with Existing Conditions and Alternative A would exceed the 630 µmhos/cm Above Normal water year standard approximately one percent of the years, and all of the years would be well under the 1,140 µmhos/cm Below Normal water year standard. During May, Alternative A and Existing Conditions would exceed 450 µmhos/cm in approximately 15 percent of the years, exceed 630 µmhos/cm in seven percent of the years, and exceed 1,140 µmhos/cm in approximately four percent of the years. In all of the years, the May monthly average EC would be less than the 1,670 µmhos/cm Dry water year standard. Therefore, in terms of compliance with D-1641 salinity standards at Emmaton, Alternative A is expected to perform, similar to Existing Conditions.

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location also indicate that Alternative A, when compared to the No Project/No Action Alternative, would result in similar or lower EC levels during June through December and elevated EC levels during January through May (up to 6.4 percent). Modeled water year type monthly average EC values indicate similar trends, with increased EC during January through May and decreased EC in other months. The largest increase in average EC is expected to occur in February in Critical water years, where the EC would increase by 25.8 percent from approximately 404 µmhos/cm with the No Project/No Action Alternative to approximately 508 µmhos/cm with Alternative A. January through May months typically have lower EC levels in the Delta because of the high natural runoff from the upstream watersheds and less salinity intrusion from the San Francisco Bay.

To verify if the minor increases in average EC levels expected in April and May with implementation of Alternative A would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than five percent of the years with Alternative A and the No Project/No Action Alternative. Similarly, the monthly average EC in April with the No Project/No Action Alternative and Alternative A would exceed 630 µmhos/cm in one percent of the years, and all of the years would be well under 1,140 µmhos/cm. For May, Alternative A and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately 15 percent of the years, exceed 630 µmhos/cm in eight percent of the years, and exceed 1,140 µmhos/cm in approximately four percent of the years. In all of the years, the May monthly average EC would be less than 1,670 µmhos/cm. Therefore, in terms of compliance with D-1641 salinity standards at Emmaton, Alternative A is expected to perform similar to the No Project/No Action Alternative.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location indicate that Alternative A, when compared to Existing Conditions, would result in similar or lower EC levels during all months except November, when EC levels are expected to increase by 2.4 percent. Modeled water year type average monthly EC values for Alternative A indicate lower or similar EC values, when compared to Existing Conditions during January through August months, and higher EC values during September through December by up to 28.5 percent in the Wet and Above Normal water years. In Below Normal and Dry water year types, the average EC values with implementation of Alternative A would be lower or similar to Existing Conditions in all months. In the Critical water year types, the average EC with implementation of Alternative A would be lower or similar to Existing Conditions in June through August, October, December, and January, and higher in September, November, and February through May months by up to 5.5 percent.

To verify if the minor increases in average EC levels associated with implementation of Alternative A would impact compliance with D-1641 salinity standards at Jersey Point, exceedance probability plots of the monthly average EC values for Alternative A were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than 0.5 percent of the years with Alternative A and Existing Conditions, and all of the years would be well under 740 µmhos/cm. Similarly, the monthly average EC in May with Existing Conditions and Alternative A would exceed 450 µmhos/cm in approximately six percent of the years, would exceed 740 µmhos/cm in approximately three percent of the years, and all of the years would be well under 1,350 µmhos/cm. For June, July, and August, the number of years that Alternative A would exceed the compliance standards at Jersey Point would be similar to or lower than Existing Conditions. Therefore, in terms of compliance with D-1641 salinity standards at Jersey Point, Alternative A would perform similar to Existing Conditions.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location with implementation of Alternative A, when compared to the No Project/No Action Alternative, indicate similar or lower EC levels during June through October and December, and higher EC levels during November, and January through May, where EC is expected to increase by up to 4.9 percent. Modeled water year type average monthly EC values for Alternative A indicate lower or similar EC values, when compared to the No Project/No Action Alternative during January through August months, and higher EC values during September through December by up to 17.6 percent in the Wet water years. In Above Normal water years, Alternative A EC levels are expected to be lower or similar in March through June months and in August and September, with increased EC levels in other months by up to 26 percent, when compared to the No Project/No Action Alternative. In Below Normal and Dry water years, the average EC values with implementation of Alternative A are expected to be lower or similar to the No Project/No Action Alternative in the most months. January, February, and March are expected to have slightly elevated EC levels of up to 3.5 percent with Alternative A, when compared to the No Project/No Action Alternative in the Below Normal water years. In Dry water years, the average EC levels with Alternative A are expected to increase by up to 2.7 percent, when compared to the No Project/No Action Alternative, in April, November, and December. In Critical water years, the average EC with Alternative A is expected to be lower or similar to the No Project/No Action Alternative in June, July, October, and December, and higher in August, September, November, and January through May by up to 10.2 percent.

To verify if the minor increases in the average EC levels expected in April and May with implementation of Alternative A would impact compliance with D-1641 standards at Jersey Point, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. As indicated in the EC exceedance plots, the monthly average EC in April would exceed 450 µmhos/cm in approximately 0.5 percent of the years with Alternative A and the No Project/No Action Alternative, and all of the years are expected to be well under 740 µmhos/cm. For May, both Alternative A and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately five percent of the years, exceed 740 µmhos/cm in three percent of the years, and in all of the years, the May monthly average EC would be less than 1,350 µmhos/cm. For June, July, and August, the number of years that Alternative A would exceed the compliance standards at Jersey Point is similar to or lower than those of the No Project/No Action Alternative. Therefore, in terms of the compliance with D-1641 salinity standards at Jersey Point, Alternative A would perform similar to the No Project/No Action Alternative.

Implementation of Alternative A would provide supplemental Delta outflow during summer and fall months (May through December) to improve X2 position and increase estuarine habitat. Modeling results indicate that implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would result in eastward movement of X2 by up to 0.9 km in December through May, and a westward movement of X2 by up to 1.4 km in June through November on a long-term average basis. In Wet water years, the average X2 position with Alternative A would move eastward in October through May by up to 0.7 km, and would move up to 1.2 km westward in June through September, when compared to Existing Conditions and the No Project/No Action Alternative. In Above Normal water years, the average X2 position with Alternative A would move eastward in

November through May by up to 0.9 km, and would move up to 1.6 km westward in June through October, when compared to Existing Conditions and the No Project/No Action Alternative. In Below Normal and Dry water years, the average X2 position with Alternative A would move eastward in January through May by up to 1.7 km, and would move up to 1.9 km westward in June through December, when compared to Existing Conditions and the No Project/No Action Alternative. In Critical water years, the average X2 position with implementation of Alternative A would move eastward in February through May and November by up to two km, and would move up to 1.2 km westward in June through January, when compared to Existing Conditions and the No Project/No Action Alternative.

Even though modeling results for the average X2 position in the February through June D-1641compliance period indicate slight eastward movement, Alternative A would comply with the D-1641 spring X2 position requirements. During the September through November compliance period, the monthly average X2 position with implementation of Alternative A would be at or westward of the X2 position for Existing Conditions and the No Project/No Action Alternative.

Implementation of Alternative A would generally improve Delta salinity conditions in the summer and fall months, which are the peak salinity intrusion periods, with minor increased EC levels in the winter and spring months Alternative A complies with the X2 standards for both spring and fall. Salinity conditions at the Emmaton and Jersey Point compliance locations and X2 location are good indicators of the salinity conditions in the Delta. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the salinity conditions in the Delta. EC is a good indicator of other water quality constituents in the Delta. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the other water quality constituents in the Delta.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for the Delta, and there are no specific water temperature criteria in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB, 2006). However, water temperatures in the Delta approach equilibrium temperatures where the meteorological conditions primarily influence the water temperatures. Thus, the differences between Alternative A and Existing Conditions and the No Project/No Action Alternative are minimized. Therefore, implementation of Alternative A would results in a **less-than-significant impact** on water temperature in the Delta**,** when compared to Existing Conditions and the No Project/No Action Alternative.

Suisun Bay, San Pablo Bay, San Francisco Bay

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Model simulations for Delta outflow indicate that implementation of Alternative A would result in increased average monthly outflow in the summer and fall months, when conditions are relatively Dry, and small reductions in Delta outflow in the winter and spring months, when the conditions are Wet, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, these changes would result in a **less-than-significant impact** to the water quality conditions in Suisun Bay, San

Pablo Bay, and San Francisco Bay with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for Suisun Bay, San Pablo Bay, or San Francisco Bay, and there are no specific water temperature criteria in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB, 2006). Based on the seasonal flow changes described above with the implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, and because temperatures in Suisun Bay, San Pablo Bay, and San Francisco Bay are primarily controlled by the meteorological conditions, the impacts to water temperature would be **less than significant**.

7.3.6.3 *Primary Study Area – Alternative A*

Construction, Operation, and Maintenance Impacts

Impacts to surface water quality could result from the following Project construction activities:

- Soil disturbing activities such as clearing, grubbing, and earthwork that may affect drainage patterns and contribute to erosion and increased turbidity in receiving waters.
- Stockpiles of construction material that have the potential to contribute to increased deposition of sediment to receiving waters through stormwater and wind erosion.
- New unpaved construction access roads that may contribute to increased sediment deposition through wind erosion.
- Construction-related hazardous material spills.
- Temporary diversion of surface waters around construction sites.
- Dewatering of shallow groundwater.
- Disposal of concrete waste.
- Vehicle and equipment cleaning, fueling, and maintenance.
- Pile driving activities.

These activities and their potential effects on surface water quality are discussed below for the Project facilities that are proposed as part of Alternative A.

Sites Reservoir Inundation Area

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The proposed 1.27-MAF Sites Reservoir would inundate Stone Corral, Funks, Grapevine, and Antelope creeks. It would also inundate Salt Lake. Construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around construction sites, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills.

These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Salt Lake is a 28-acre area of impounded water and seasonal wetlands located within the Sites Reservoir Inundation Area. Salt Lake is formed by warm salt springs that occur upslope. Measured EC, hardness, total dissolved solids, dissolved sodium, chloride, magnesium, and boron exceeded all applicable Central Valley Basin Plan criteria (DWR, 2012) at Salt Lake. In addition, a few metals were noted at very high concentrations (aluminum, iron, and manganese) and exceeded all criteria; and a few others exceeded some criteria (arsenic, copper, lead, and nickel). Levels of some nutrients (ammonia and orthophosphate) were noted at high levels and exceeded Central Valley Basin Plan criteria (CVRWQCB, 2011). The impact to Sites Reservoir water quality that would result from Salt Lake impoundment within the reservoir footprint would be **potentially significant.**

Refer to the **Impact SW Qual-1** discussion for the Sacramento River (Secondary Study Area discussion) for the effects of Sites Reservoir diversions and releases. Implementation of Alternative A is expected to result in a worst-case long-term average EC of 190 to 192 µmhos/cm in Sites Reservoir. The EC levels would not vary significantly among various months. Fall months show slightly lower EC levels, when compared to spring months, when Sites Reservoir is filled with water from the Sacramento River. Modeled water year type averages indicate that average worst-case EC levels would range from approximately 187 µmhos/cm in fall months of Above Normal water years to 195 µmhos/cm in spring months of Critical water years. The worst-case EC calculations include only EC from the river; they do not include EC from the inundated soils and do not consider evaporation. Based on the above model observations, releases from the reservoir into Funks and Stone Corral creeks, as well as releases into the T-C and GCID canals, would have average worst-case EC levels that fall well below the Ag Goal that is protective of agricultural water uses. Therefore, implementation of Alternative A would result in a **less-than-significant impact** in the receiving waters affected by releases from Sites Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Although Project impacts to EC levels as an indicator of expected general water quality conditions suggest municipal and agricultural beneficial uses would be affected at a less-than-significant level, Project effects for numerous other water quality constituents of concern are not well understood. In newly constructed reservoirs, water quality issues commonly include eutrophication (nutrient enrichment leading to nuisance algal production), sedimentation, stratification, oxygen depletion, and chemical changes in the deeper layers. The extent to which these occur depends largely upon the morphometric (i.e., size and depth) and limnological (water biology) characteristics of the reservoir, such as mixing (wind and seasonal factors), light penetration, and biological productivity, all of which are affected to some extent by the source of water, richness of the soils being flooded, and operation of the dam (URS, 2002). These water quality issues, including sedimentation, eutrophication, oxygen depletion, methylmercury levels, and chemical transformations within the water column, were not modeled, and are, therefore, considered to be **potentially significant** with implementation of Alternative A.

Maintenance activities would include debris and vegetation removal from the embankments. In addition, ongoing movement and seepage monitoring would be necessary. Impacts associated with these maintenance activities are expected to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-2** Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on surface water temperatures. That discussion of Sites Reservoir release temperatures is applicable to release temperatures in Funks and Stone Corral creeks, as well as to the T-C and GCID canals.

Sites Reservoir Dams

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction of Golden Gate Dam would result in an obstruction of flows to Funks Creek, and the construction of Sites Dam would result in an obstruction of Stone Corral Creek. Some boring would occur during grout injection of damsites during which drilling mud would be used. Drilling mud is typically a betonite (clay)-based material containing various chemical additives that may have deleterious effects if discharged into receiving waters. Some blasting may be necessary during the preparation of the dam foundations. Construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around construction sites, dewatering, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative. Once the dams are constructed and Sites Reservoir is filled, there are few dam operations required, other than the release of water from the reservoir during normal operations using the multi-level intake to optimize water quality and temperatures, or emergency operational releases. Releases could affect water quality within Sites Reservoir or downstream in receiving waters. However, these impacts are discussed for the appropriate receiving bodies of water. Typical ongoing dam maintenance would consist of equipment, foundation, and embankment inspections and repairs. Debris and vegetation removal from the embankments would be required. In addition, ongoing movement and seepage monitoring would be necessary. Water quality impacts associated with these maintenance activities would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

The saddle dams surrounding Sites Reservoir are not located near a stream, and therefore, would have **no impact** on water temperatures during construction. During construction of Sites and Golden Gate dams, the ephemeral Funks and Stone Corral creeks would be diverted. Funks Creek would be diverted away from the Golden Gate Dam construction site and routed to Stone Corral Creek; however, flows would continue to be released downstream of Funks Reservoir to maintain aquatic life. Stone Corral Creek and flows from Funks Creek would then be diverted around the Sites Dam construction site to continue downstream in the Stone Corral Creek channel. Cofferdams would be used to impound water at both sites before waters are diverted. Flow patterns would not be altered substantially from existing ephemeral conditions, and there are no downstream coldwater beneficial uses. Dam construction would, therefore, result in a **less-than-significant impact** on water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation, the saddle dams would not release water and would, therefore, have **no impact** on water temperatures. Sites and Golden Gate dams would release maintenance flows into Stone Corral and

Funks creeks, respectively. Refer to the **Impact SW Qual-2** Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperatures. That discussion of Sites Reservoir release temperatures is applicable to release temperatures in Funks and Stone Corral creeks.

Typical ongoing dam maintenance would consist of equipment, foundation, and embankment inspections and repairs. Debris and vegetation removal from the embankments would be required. In addition, ongoing movement and seepage monitoring would be necessary. These maintenance activities would occur outside of the proposed reservoir, and would have a **less-than-significant impact** on water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

It is anticipated that all construction activities associated with the five proposed recreation areas would occur within the footprints of the recreation areas, associated boat ramps, and the temporary and permanent access road/utility areas. Construction activities would result in ground-disturbing activities, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations of these recreational facilities would include recreation use such as hiking, camping, picnicking, and swimming. These activities could result in increased erosion, accidental hazardous or other types of materials spills, or the introduction of detergents, sewage, or solid wastes to the proposed reservoir. The provision of designated roads, trails, parking lots, campsites, beaches, day use areas, restrooms, and garbage containers would reduce the potential impacts of these activities to **less than significant**.

Recreation use would also include boating. Accidental hazardous spills from motorboats primarily occur while fueling at marina facilities. No marina or fueling facilities would be constructed at Sites Reservoir. Therefore, motorboat operation associated with recreation activities would be expected to have a **less-than-significant impact** on surface water quality.

Maintenance activities would include periodic inspection and repair of wells and water systems; vegetation trimming and management; restroom/vault toilet cleaning, stocking of supplies, pumpout, inspection, and repair; and road grading. During peak recreation use periods, these activities would likely occur on a daily basis, except for road grading, which is expected to occur once per year prior to the start of the recreation season, and repairs, which would occur when needed. During the non-peak period, the activities other than road grading would likely occur on a weekly basis and repairs would occur when needed. Water quality impacts associated with most of the described maintenance activities are, therefore, expected to be **less than significant**. However, road grading activities could result in a **potentially significant impact** due to increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The construction disturbance area for the road relocations would include the footprint of the proposed roads and stream crossings, the materials and equipment staging areas, the area needed to construct the facilities, and construction access roads. Given the miles of new asphalt roads being constructed for the Project and the remote site location, an asphalt batch plant would be built on-site adjacent to the Field Office Maintenance Yard. Construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around construction sites, dewatering, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, vehicles associated with recreational users, operations staff, and local traffic have the potential to leak fluids, resulting in accidental hazardous or other types of materials spills while traveling on the roads and the bridge. Potential pollutant sources from the Project roads and bridge include motor vehicles; highway surface materials, such as fine particles of asphalt and concrete; erodible shoulder materials; eroding cut and filled slopes; abrasive sand and deicing salts used in winter operations; abraded tire rubber; illegal dumping; and fluids from accidents and spills (SWRCB, 2012b). Pollutant categories include, but are not limited to, metals (such as copper, lead, and zinc); synthetic organic compounds (pesticides); Polycyclic Aromatic Hydrocarbons (PAHs) from vehicle emissions, oil, and grease; Total Petroleum Hydrocarbons (TPH); sediment; nutrients (nitrogen and phosphorus fertilizers); debris (trash and litter); pathogens; and oxygen demanding substances (decaying vegetation, animal waste, and other organic matter (SWRCB, 2012b).These pollutants are at risk of entering natural receiving waters during precipitation events and would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Typical paved road maintenance would include chip sealing, patching, crack filling, asphalt overlays, embankment erosion repair, and vegetation control and maintenance. Typical culvert and minor bridge maintenance would include debris removal. Gravel road maintenance could include periodic grading. Typical bridge maintenance would include debris clearing from bridge deck and deck drainage outlets and abutment erosion maintenance and repair. Bridge maintenance could also include the periodic repair of guard rails, or the replacement of light fixtures. These maintenance activities could result in the accidental spill of hazardous materials or concrete waste, and therefore, would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure and Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction activities associated with these facilities would result in ground-disturbing activities, the temporary diversion of surface waters around construction sites, dewatering, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would, therefore, have a **potentially significant impact** on surface water quality when compared to Existing Conditions and the No Project/No Action Alternative.

These facilities would only convey water to and from Sites Reservoir; therefore, their operation would have **no impact** on surface water quality.

Routine maintenance and monitoring would likely be required on a daily basis. Regular maintenance and inspection would be done for each pump unit and the related equipment, such as gates, valves, and electrical equipment. It is possible that accidental spills of lubricants or other fluids could occur during maintenance of the pumping/generating plant. However, the plant design includes a spill containment system and a hazardous materials storage sump. Therefore, these maintenance activities would have a **less-than-significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

The pumping plant, inlet structure, and tunnel are not located near a stream, and therefore, would have **no impact** on water temperatures during construction. The footprint of the outlet structure would overlap with a portion of Funks Creek, upstream of Funks Reservoir. During construction of this facility, Funks Creek would be diverted away from the construction site, and releases would be made into Funks Creek downstream of Funks Reservoir to maintain aquatic life. Flows from Funks Creek would be diverted around the Sites Dam construction site to continue downstream in the Stone Corral Creek channel. Flow patterns would not be substantially altered from existing ephemeral conditions, and there are no downstream coldwater beneficial uses. Outlet structure construction would therefore result in a **less-than-significant impact** on water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation, these Project facilities would convey water to and from Sites Reservoir. Refer to the **Impact SW Qual-2** Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperatures.

Routine maintenance, including the inspection of equipment, would not be expected to interfere with facilities operations and would, therefore, have **no impact** on water temperatures, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Electrical Switchyard, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The construction disturbance area for the Delevan Pipeline Electrical Switchyard and Delevan Transmission Line would be completely contained within the construction disturbance area of the Delevan Pipeline. The existing agricultural fields where the transmission line alignment would cross would be fallowed and not watered. Anticipated major construction activities include clearing and grading the construction workspace; placing necessary construction materials at staging areas; preparing the substation pads, and excavating and constructing tower footings. The construction disturbance area for the switchyards would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, electrical transformer area, and temporary access roads. Construction activities would result in ground-disturbing activities and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the switchyards and transmission lines is an unmanned activity. Because these facilities would not store or release water, their operation would have **no impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

The transmission line would require only periodic inspection and maintenance (once or twice a year), using few vehicles and personnel. The maintenance activities would, therefore, result in **no impact** to water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance of the electrical switchyards may include annual washing and cleaning of insulating equipment, and landscape maintenance. These maintenance activities could result in ground disturbance and accidental hazardous or other types of materials spills. Therefore, the maintenance of these facilities would be a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Field Office Maintenance Yard

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction of the Field Office Maintenance Yard would include transportation and placement of materials to the Project site, clearing and grading, construction of the buildings and ancillary facilities (e.g., leach field, water treatment, incinerator), and site restoration after construction is complete. Construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around the Project construction site, and could result in increased erosion, sediment deposition, and/or accidental hazardous or other types of materials spills. These construction activities would have a **potentially significant** impact on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Spare parts for mechanical and electrical equipment would be stored in the warehouse along with lubricants, oils, and greases to maintain equipment. Daily operations could include personnel traveling from the Field Office Maintenance Yard to Project facilities and performing scheduled repairs and maintenance of Project equipment, observing canals and Project facilities, fueling and washing vehicles and equipment, gathering technical data on water quality and Project facilities, and as-needed repairs. Equipment repair and overhaul (e.g., pumps, turbines) may take place at this facility.

Operational activities related to the storage of hazardous materials and repair of equipment and vehicles could result in accidental spills, and could, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Periodic maintenance would be performed on an as-needed basis including road, vegetation, and fence maintenance, as well as debris removal. These maintenance activities could result in increased erosion, sediment deposition, or accidental hazardous or other types of materials spills, and would, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The existing Funks Reservoir would be dredged to remove accumulated sediment. Funks Creek would be diverted around the Project construction site, and Funks Reservoir would be dewatered. Installation of a T-C Canal construction bypass pipeline would also be required to divert T-C Canal flows before starting modifications to the existing Funks Reservoir or constructing the new facilities. Construction activities associated with Funks Reservoir dredging, the Holthouse Reservoir Complex, and the Holthouse Reservoir Electrical Switchyard would result in ground-disturbing activities, the temporary diversion of surface waters around the Project construction site, and dewatering, and could result in increased erosion or sediment deposition. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Comparison between Alternative A modeled EC levels for Funks Reservoir versus Existing Conditions and the No Project/No Action Alternative indicate that these levels would increase by up to 37 percent during all months of all water year types. These increases in EC are expected to be greatest during the summer and fall months when flow is generally released from Sites Reservoir for agricultural use. The elevated EC values in November can be attributed to the initial Sites Reservoir inundation period following the previous release period when Sites Reservoir is at the lowest storage level for the year. Funks Reservoir and the Holthouse Reservoir Complex would be hydrologically connected, so EC levels for Holthouse Reservoir would be the same as described for Funks Reservoir. Despite these large increases, EC levels would fall below the Ag Goal that is protective of agricultural water uses. Implementation of Alternative A would, therefore, result in a **less-than-significant impact** on water quality (based on modeled EC conditions as an indicator of general water quality conditions), when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality issues, including sedimentation, eutrophication, oxygen depletion, methylmercury levels, and chemical transformations within the water column, were not modeled, and are, therefore, considered to be **potentially significant** with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

Current periodic maintenance required for the existing Funks Reservoir includes road, vegetation, and fence maintenance, as well as debris removal, on an as-needed basis. The reservoir is also drained annually. These maintenance activities are expected to continue after Funks Reservoir dredging and connection to Holthouse Reservoir. Maintenance of the electrical switchyard may include annual washing and cleaning of insulating equipment, and landscape maintenance. These maintenance activities could result in ground disturbance, the temporary diversion of surface waters around the Project construction site, accidental hazardous or other types of materials spills, and increased erosion or sediment deposition. Therefore, there would be a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Dredging activities would require the draining of Funks Reservoir; currently (i.e., Existing Conditions), the reservoir is drained annually for maintenance. A T-C Canal bypass would be constructed prior to draining the reservoir so that canal flows would not be disrupted. Construction of Holthouse Reservoir would not affect the T-C Canal, but would affect a portion of Funks Creek immediately downstream of Funks Reservoir. However, flows would be maintained in Funks Creek downstream of Funks Reservoir to maintain aquatic life. Funks Reservoir dredging and the construction of the Holthouse Reservoir Complex would, therefore, have **no impact** on water temperatures in the T-C Canal or Funks Creek, when compared to Existing Conditions and the No Project/No Action Alternative.

The Holthouse Reservoir Complex would act as a regulating reservoir for Sites Reservoir. Refer to the **Impact SW Qual-2** Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperatures.

The existing Funks Reservoir is drained annually for maintenance. T-C Canal operations accommodate this maintenance period. This maintenance activity is expected to continue after Funks Reservoir dredging and connection to Holthouse Reservoir. T-C Canal operations would be expected to continue as they do during maintenance of the existing Funks Reservoir, and flows would be maintained downstream in Funks Creek during maintenance. Therefore, maintenance activities associated with the Holthouse Reservoir Complex would have **a less-than significant impact** on water temperatures in the T-C Canal and Funks Creek, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction activities associated with the new GCID Canal headgate structure, lining a portion of the canal, and replacing a railroad siphon would occur during the annual maintenance period when the canal is dry, but hazardous materials, sediment, and Portland cement wastes could be mobilized when the canal is re-watered. These activities would, therefore, be expected to have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the GCID Canal Intake following completion of Project construction would be similar to Existing Conditions, although an increase in wintertime operation could occur. Refer to the Secondary Study Area discussion for Sacramento River water quality impacts associated with increased diversions.

Required maintenance activities would be very similar to current maintenance. However, additional sediment removal activities may be required due to increased wintertime operation. The new headgate structure would require annual inspection and maintenance, including painting and motor control unit inspections, similar to typical check structures along the canal. Increased sediment removal activities could result in increased erosion, sediment deposition, or accidental hazardous or other types of materials spills, and would, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

There would be no impact to water temperatures resulting from modification of the GCID Canal because construction would be performed while the canal is dewatered. Following completion of the modification, operation of the canal would be similar to Existing Conditions, and annual maintenance activities would continue to be performed when the canal is dry. These activities would, therefore, be expected to have **no impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Electrical Switchyard, and Terminal Regulating Reservoir Pipeline Road

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

It is anticipated that the reservoir inlet/connection from the GCID Canal to the TRR would be constructed by first building a temporary bypass channel to the west of the existing canal alignment. The temporary bypass channel would connect into the GCID Canal upstream and downstream of the construction zone to supply water to the reach of the Canal downstream of the TRR facilities area. The temporary bypass channel would be constructed using a combination of excavation, earth embankment, and sheet pile walls to isolate the Project construction site from the diversion canal. Anticipated major construction activities associated with the remaining TRR facilities include transportation of materials to the Project site, clearing and grading the construction work space, staging of construction materials, dewatering, and excavation and embankment construction. Construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around Project construction sites, and could result in increased erosion or sediment deposition. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Operational impacts to water quality for the TRR and for potential releases from the TRR to the Funks Creek Pipeline into Funks Creek are expected to be the same as described for the GCID Canal intake structure. These impacts would be **less than significant** for EC as a general water quality indicator. However, sedimentation, eutrophication, oxygen depletion, and chemical transformations within the water column have not been evaluated, and would, therefore, have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would include removing debris that could collect upstream of check structures, maintaining gate operators to provide adequate control of gates, periodically repairing and re-painting the connection, road maintenance, and dredging the dissipation bay and inlet channel for sediment concurrently with the TRR dredging. Maintenance of the electrical switchyard may include annual washing and cleaning of insulating equipment, and landscape maintenance. Typical maintenance of the reservoir would include dredging to remove sediment when the reservoir is drained, clearing vegetation from the slopes of the embankments, and maintaining the gravel service road atop the embankment. Maintenance activities could result in ground-disturbing activities accidental hazardous or other types of materials spills, and increased erosion or sediment deposition. These maintenance activities would have a

potentially significant impact on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Prior to the start of construction of these facilities, a temporary bypass channel would be constructed to connect into the GCID Canal upstream and downstream of the construction disturbance area. During construction of these facilities, water deliveries within the canal would not be interrupted. Construction activities would, therefore, have **no impact** on water temperatures within the canal, when compared to Existing Conditions and the No Project/No Action Alternative.

For the impacts of the integrated operation of these facilities with Sites Reservoir releases on water temperatures, refer to the Alternative A Secondary Study Area **Impact SW Qual-2** discussion for the Sacramento River.

Maintenance activities that could affect the GCID Canal would be performed during the annual maintenance period of the canal, and would, therefore, have **no impact** on water temperatures within the canal, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction of the Delevan Pipeline would likely be performed in independent and concurrent sections. Construction of two of the sections would likely begin from the same point and move in opposite directions. As pipelines are installed and tested, the trench would be backfilled to minimize the amount of trench that is left open. Approximately 6.3 million cubic yards of material would be excavated for the pipeline trench. Excavated material would be stockpiled within the construction disturbance area and managed with standard stormwater pollution prevention practices. Trench side slopes would be approximately 1:1.5. No shoring would be installed under normal excavation conditions. Dewatering of the trench would be necessary in many locations and could be permitted to discharge into local irrigation ditches and drainage canals and/or the CBD after settling of silt. One foot of bedding material would be installed in the trench before installation of the pipeline. Bedding material would likely be sand, consolidated backfill, or cemented controlled density fill (CDF).

Excavated material would be reused to backfill the pipeline trench or would be moved to other Project locations for use, to the extent possible, after placement of the pipes. Excess spoils from the excavation (estimated at 1.3 cubic yards) would be spread on adjacent agricultural lands of willing landowners within the 800-yard-wide corridor along the pipeline alignment, used as backfill at the Sacramento River Pumping/Generating Plant, or placed in the Sites Reservoir footprint. These construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around the Project construction site, dewatering, and could result in increased erosion or sediment deposition. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

The Delevan Pipeline would convey water to and from Sites Reservoir and its associated regulating reservoirs, and therefore, the pipeline’s operation would have **no impact** on surface water quality.

Periodic pipeline inspection and maintenance would likely occur once per year, typically in the months of April and May, with possible additional inspections and maintenance needed after earthquakes or storm, flood, or other emergency events. Permanent rights-of-way for the land overlying the pipeline would be maintained to guarantee future access. These routine maintenance activities are expected to have a **less-than-significant impact** to water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Because the Delevan Pipeline would convey water underground between Sites Reservoir and its associated regulating reservoirs and the Sacramento River, it is expected to have **no impact** to water temperatures.

Delevan Pipeline Intake Facilities

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The Delevan Pipeline Intake Facilities are a system of structures designed to divert water from the Sacramento River, to safely release water from Sites Reservoir to the Sacramento River, and to generate electricity when water is released from Holthouse Reservoir through the Delevan Pipeline to the Sacramento River.

To isolate the construction area from the Sacramento River, a cellular sheet pile cofferdam would be installed in the Sacramento River near the location of the proposed fish screen. Approximately 1,200 feet of sheet piles would be required. The cofferdam would likely remain in place throughout the duration of Project facility construction. The area behind the cofferdam would be dewatered prior to construction by pumping water out from behind the cofferdam. After construction of the Project pump station is complete, the cofferdam would be removed by pulling the sheet piles out of the river and restoring the river to its previous condition. These construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around the Project construction site, dewatering, and could result in increased erosion or sediment deposition. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Diversion operations would be such that a minimum of 4,000 cfs would remain in the river channel immediately downstream of the diversion point. The expected associated minimum water surface elevation at this design condition is 51 feet. The invert of the screen structure would be set at 38 feet (four feet above the invert of the river) to reduce sediment deposition in front of the screen panels.

Intake mode would occur when the diversion is pumping water from the Sacramento River to Sites Reservoir. The Intake Facility would have the largest flows and velocities during intake mode. Water would flow through the fish screen into the forebay, through the levee tubes, into the afterbay, and then would be pumped to Sites Reservoir. During this operation, the screen cleaning mechanism would be working continuously to prevent buildup on the screen panels, and the sediment removal system would operate.

Discharge mode would occur when water from Sites Reservoir would flow back through the pumping plant to generate electricity, and the water would be discharged into the afterbay, through the levee tubes, into the forebay, and then through the fish screen and into the Sacramento River. During this activity, the sediment removal system would operate.

The diversions and the discharge at the Delevan Pipeline Intake Facilities would contribute to the worst-case EC levels in the Sacramento River. Refer to the Secondary Study Area discussion for Sacramento River water quality impacts associated with these diversions and discharges.

A jetted-piping sediment removal system would be installed behind the fish screens, moving sediment that collects behind the fish screens back into the river channel, or into the forebay. Sediment that settles in the forebay would be removed, as needed, with mechanical dredging equipment to maintain optimal operational hydraulics. Depending on sediment load in the river, the forebay may need to be cleaned annually. Operation of the sediment removal system has the potential to adversely affect turbidity in the Sacramento River if excess sediment is moved back into the river channel. This impact would be **potentially significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the Alternative A **Impact SW Qual-2** Secondary Study Area discussion for the Sacramento River regarding water temperature impacts associated with diversions and releases from the Delevan Pipeline Intake Facilities.

Project Buffer

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Construction activities within the Project Buffer include the demolition and removal of existing structures, installation of fencing, and the creation of a fuelbreak. These ground-disturbing activities may cause erosion that could result in a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Agricultural lands within the Project Buffer would be converted to annual vegetative cover to prevent wind and water erosion of soil. This conversion would minimize the potential for erosion, and would therefore, be expected to have a **less than significant impact** on surface water quality, when compared to Existing Conditions and the No Project/ No Action Alternative.

No activities are planned or expected to occur within the Project Buffer during Project operation. Operation of the buffer would, therefore, have **no impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative. Project maintenance activities would include fence repair and fuelbreak maintenance.

Fence repair, such as the replacement of a post or barbed wire, would require little to no ground disturbance, and would, therefore, have a **less-than significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Fuelbreak maintenance, which could include additional disking or grading activities that would result in ground disturbance, may cause erosion that could result in a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

7.3.7 Impacts Associated with Alternative B

7.3.7.1 *Extended Study Area – Alternative B*

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Comparison of the modeled long-term average EC levels for Alternative B and Existing Conditions at Clifton Court Forebay indicates that EC levels are expected to decrease by up to 8.3 percent in all months. Comparing the water year type averages, EC levels for Alternative B would be reduced in nearly all months of all water year types. Minor increases of up to 4.3 percent are expected primarily in November and December of Above Normal water years, and October of Critical water years. The modeled long-term average and water year type average EC levels at the Jones Pumping Plant with implementation of Alternative B, when compared to Existing Conditions would be similarly reduced, with the exception of negligible increases of up to 1.9 percent in November of Above Normal water years and October of Critical water years.

Comparison of the modeled long-term average EC levels for Alternative B and the No Project/No Action Alternative at Clifton Court Forebay indicates that EC levels are expected to decrease or remain similar in all months. Negligible increases of up to 0.8 percent in the long-term average EC are expected to occur in December. Comparing the water year type averages, EC levels with implementation of Alternative B are expected to increase by up to 2.5 percent in December, March through May, and July in Wet water years. EC levels are also expected to increase by up to 5.8 percent in November through July in Above Normal water years; by up to 1.3 percent in April, May, and July of Below Normal water years; by up to 2.5 percent in December, May, and June in Dry water years; and by up to 3.4 percent in October and December of Critical water years. The modeled long-term average EC levels at the Jones Pumping Plant with implementation of Alternative B are also expected to be lower or similar to the No Project/No Action Alternative in most months, with negligible increases of up to 0.7 percent expected in December and March through June. Comparing the water year type averages, EC levels with implementation of Alternative B at the Jones Pumping Plant are expected to increase similarly to those described for Clifton Court Forebay, but would experience negligible increases in EC levels during more months in Below Normal, Dry, and Critical water years.

Similar to Alternative A, modeling results indicate that Alternative B is expected to reduce the long-term average export-weighted EC, TDS, chloride, and bromide concentrations, when compared to Existing Conditions and the No Project/No Action Alternative. Similarly, the Dry and Critical water year average export-weighted concentrations are expected to decrease with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative.

Although minor increases in EC levels are expected with implementation of Alternative B, the largest of all of the increases are expected to occur in July, November, and December during Above Normal water years, which have relatively wetter conditions. The resulting increased EC levels for Above Normal water years for these months would be highest in December (up to 517 µmhos/cm). These modeled increases in EC levels are, therefore, expected to be below the Ag Goal and drinking water goal.

During the Below Normal, Dry, and Critical water year types, the expected negligible increases would result in higher EC levels than those described for Above Normal water years. The highest EC levels resulting from an increase would occur during the time of year when the Ag Goal is 1,000 µmhos/cm (September through March), and the drinking water goal is 900 µmhos/cm. The highest EC level resulting from an increase (772 µmhos/cm) is expected to occur during December of Critical water years at the Jones Pumping Plant. These modeled increases in EC levels are, therefore, expected to be below the Ag Goal and drinking water goal.

Therefore, implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on EC levels, TDS, bromide, and chloride concentrations associated with agricultural, municipal, industrial, and wildlife refuge water supply.

Other water quality parameters, such as metals and nutrients, were not modeled as part of this analysis. The potential changes to the concentrations of these constituents are unknown at this time. However, the overall improvements in EC levels with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, are expected to translate into improvements in the concentrations of these constituents. Therefore, implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the concentrations of nutrients, metals, and other water quality constituents, including mercury, associated with the deliveries for agricultural, municipal, industrial, and wildlife refuge use.

San Luis Reservoir

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Similar to Alternative A, implementation of Alternative B would result in continued water level fluctuations at San Luis Reservoir and minor decreases in end-of-month long-term average surface water elevations of up to six feet in June through October, when compared to Existing Conditions. A comparison of water year type averages indicates an increase in elevation of up to nineteen feet during all months in Critical water years. During Below Normal and Dry water years, increases of up to seven feet are expected in January through August. Elevations would, therefore, be improved during periods in which algae blooms are a concern, except for during September and October in Above Normal water years and July through October in Dry water years when there would be decreases of up to 10 feet.

Similar to Alternative A, modeled end-of-month long-term average surface water elevations for Alternative B, when compared to the No Project/No Action Alternative, indicate minor decreases of up to three feet during June through August. These decreases in surface water elevation fall within the historic range of operation for San Luis Reservoir. A comparison of water year type averages indicates an increase of up to eight feet in all months of Below Normal water years. Elevations are expected to decrease up to 14 feet in April through November in Dry water years, and in May through August, October, and December in Critical water years.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet 100 percent of the years in December through May with both Alternative B and Existing Conditions. In June, Existing Conditions would exceed 250,000 acre-feet approximately 87 percent of the years, and Alternative B would exceed 250,000 acre-feet approximately 92 percent of the years. In July and August, Existing Conditions would exceed 250,000 acre-feet approximately 80 percent of the years, and Alternative B would exceed 250,000 acre-feet approximately 82 percent of the years. In September, Existing Conditions would exceed 250,000 acre-feet approximately 94 percent of the years, and Alternative B would exceed 250,000 acre-feet approximately 98 percent of the years. Alternative B would perform similarly to Existing Conditions in October.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet 100 percent of the years in December through May with both Alternative B and the No Project/No Action Alternative. Alternative B and the No Project/No Action Alternative would perform within a two percent difference of each other during June and September through November, and would perform similarly to each other in July and August.

Even with the expected decreases in surface water elevations associated with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, the end-of-month storage exceedances of 250,000 acre-feet would be similar or improved with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, operational changes at San Luis Reservoir would be expected to have a **less-than-significant impact** on nuisance algae blooms, when compared to Existing Conditions and the No Project/No Action Alternative.

The impact findings for the Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use water quality conditions are directly applicable to San Luis Reservoir. Therefore, implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on EC levels; TDS, bromide, and chloride concentrations; metals, nutrients, and other water quality constituents in the San Luis Reservoir.

7.3.7.2 *Secondary Study Area – Alternative B*

Construction, Operation, and Maintenance Impacts

Implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would result in improved storage conditions similar to those described for Alternative A at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. In addition, Whiskeytown Lake, Lewiston Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma would continue to operate as regulating reservoirs within their historical operational range, as described for Alternative A. Therefore, the impact of Alternative B on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2**) within these reservoirs would be the same as described for Alternative A. Consequently, modeling results show that releases from these reservoirs into the Trinity River, Klamath River downstream of the Trinity River, Clear Creek, Spring Creek, the Feather River, and the American River would also have the same impacts on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2)** as was described for Alternative A.

Construction, operation, and maintenance activities at the Red Bluff Pumping Plant would be the same with implementation of Alternative B as was described for Alternative A, and would, therefore, have the same impacts on surface water quality (**Impact SW Qual-1**) and water temperature(**Impact SW Qual-2)**.

Alternative B would include a 1.81-MAF Sites Reservoir, and would replace the Delevan Pipeline Intake Facilities with the Delevan Pipeline Discharge Facility. These changes in storage and diversion capacity would result in operational effects to downstream Project facilities that differ slightly from those described for Alternative A. Therefore, the operational impacts of Alternative B on surface water quality and water temperatures for the remaining Project facilities in the Secondary Study Area are described below.

Sacramento River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Implementation of Alternative B would have effects on Sacramento River EC levels upstream of the Delevan Pipeline Discharge Facility location similar to those described for Alternative A, because the long-term average worst-case EC estimated at the T-C Canal Intake with implementation of Alternative B for the Sacramento River reach between Keswick and Red Bluff is expected to decrease or remain similar in all months, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, the worst-case EC estimated at the GCID Canal Intake for the reach between Red Bluff and Hamilton City is expected to remain similar in most of the months with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative. The worst-case EC levels for the Sacramento River reach between the GCID Canal Intake and the Delevan Pipeline Discharge Facility location indicate similar trends as the upstream reaches, when Alternative B is compared to the Existing Conditions and No Project/No Action Alternative. However, downstream of the Delevan Pipeline Discharge Facility, worst-case EC levels in the Sacramento River associated with Alternative B would differ from Alternative A, because Alternative B includes a discharge-only facility, rather than the intake facility included with Alternative A. Similar to Alternative A, long-term average worst-case EC levels in the Sacramento River are expected to increase in all months with Alternative B, and increase in most months in all water year types, when compared to Existing Conditions and the No Project/No Action Alternative. However, the increases associated with Alternative B are not expected to be as great as those described for Alternative A, with the largest of the increases expected to occur in April (up to 4.2 percent) and to a lesser extent in fall months (up to 3.8 percent).

The EC levels for the Sacramento River reach from the CBD to the entrance of the Delta at the I Street Bridge were not estimated explicitly. However, the changes in the EC levels in this reach are expected to trend consistently with the changes found in the upper Sacramento River reaches.

The increased EC levels with Alternative B are a result of reduction in the flows released from the Shasta Reservoir. Further, in the winter and spring months, the increased diversions at the two intakes to fill the Sites Reservoir would contribute to increased EC levels in the Sacramento River. In the summer and fall months, releases from Sites Reservoir would also cause EC levels to increase in the Sacramento River reach downstream of the Delevan Pipeline Discharge Facility. However, the water year type averages for the worst-case EC levels with Alternative B, in all months, are expected to be below the Central Valley Basin Plan requirement of 230 µmhos/cm for the Sacramento River reach upstream of the CBD.

Therefore, the minor increases in the worst-case EC levels are considered negligible, and the impact to Sacramento River EC levels due to the implementation of Alternative B would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality constituents of concern, including mercury and unknown toxicity on the 303(d) list of impaired waters, were not evaluated explicitly. However, the changes in the concentrations of the other water quality constituents are expected to be proportional to the changes in the worst-case EC levels with implementation of Alternative B from Existing Conditions and the No Project/No Action Alternative. Therefore, the impact on the water quality constituents in the Sacramento River due to the implementation of Alternative B would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Similar to Alternative A for the Sacramento River reach from Keswick to downstream of the Delevan Pipeline Discharge Facility, modeling results indicate that Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would result in similar or decreased water temperatures in summer and fall months of Below Normal, Dry, and Critical water year types when the ambient temperatures are higher. In April, Alternative B would result in slightly elevated water temperatures of up to 1.8 percent in all water year types.

Downstream of the Delevan Pipeline Discharge Facility, results based on preliminary temperature modeling of Sites Reservoir releases performed for Alternative C (Alternative C was assumed to show the worst-case conditions) would be similar with implementation of Alternative B, as was described for Alternative A.

Modeling results for water temperatures in the Sacramento River at Knights Landing indicate that implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would result in negligible changes in all months of all water year types, with the greatest increase of up to 0.6 percent expected in April in all water years. Similar to Alternative A, comparison of the average water temperatures for Alternative B to Existing Conditions and the No Project/No Action Alternative at the Freeport location indicates that the temperatures would be similar or lower in summer and fall months of all water years. For the winter and spring months (December through May), the resulting average temperatures with implementation Alternative B would be slightly elevated by up to 0.5 percent in all water years, when compared to Existing Conditions and the No Project/No Action Alternative.

Modeled average monthly temperatures by water year type for Alternative B indicate that the 68°F criterion for July through November from Hamilton City to the I Street Bridge would be exceeded at Knights Landing during all water year types, and at the Feather River and American River during all water years but Above Normal. However, it is important to note that the criterion is already exceeded with Existing Conditions and the No Project/No Action Alternative at these locations, and implementation of Alternative B would result in decreased temperatures.

Based on the above model observations, implementation of Alternative B would results in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, for the Sacramento River temperature for the reach between Keswick and the I street bridge.

Sutter Bypass and Yolo Bypass

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

As described for Alternative A, Alternative B would be operated to divert excess Sacramento River flows from November through March to fill Sites Reservoir. However, this operational scenario for the two intakes associated with Alternative B would potentially reduce flows by up to 3,900 cfs in the Sutter and

Yolo bypasses (as compared to the maximum of 5,900 cfs with the three intakes associated with Alternative A). Changes in operations associated with integrated operations of Sites Reservoir with Shasta Lake may also influence the frequency and magnitude of flows in the Sutter and Yolo bypasses. Because of the reduced rate of diversion, it is expected that the duration of diversion of excess flows to fill Sites Reservoir would be greater for Alternative B, when compared to Alternative A.

Similar to Alternative A, monthly average exceedance probability plots indicate that spills for Alternative B would be the same or similar in frequency of spills for Existing Conditions at Ord Ferry, Moulton Weir, and Colusa Weir. Exceedance probability plots for Alternative B, when compared to the No Project/No Action Alternative, indicate a similarity in frequency of spills.

Similar to Alternative A, the changes in spills for Alternative B, when compared to Existing Conditions, would vary from minor increases to decreases during high flow months when the weirs are spilling. Although the overall frequency of spills would be similar, the long-term average volume of spill for Alternative B, when compared to Existing Conditions, would decrease by approximately 5 percent at Tisdale Weir and 3 percent at Colusa Weir. Because it is expected that the duration of diversion of excess flows to fill Sites Reservoir would be greater for Alternative B, when compared to Alternative A, the period over which reductions in spills would occur would be longer, generally in the period of December through April. Exceedance probability plots for Alternative B, when compared to the No Project/No Action Alternative, show that similar decreases in the volume of spills are expected.

Spills into the Sutter Bypass from the Sacramento River represent only some of the hydrologic inputs to the lower Sutter Bypass. Similar to Alternative A, it is anticipated that the changes in spill exceedance probabilities discussed above would not have a substantial impact on surface water quality in the Sutter Bypass. Therefore, implementation of Alternative B would result in a **less-than-significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Similar to Alternative A, monthly average exceedance probability plots of Yolo Bypass flows with implementation of Alternative B, when compared to Existing Conditions, indicate lower similar exceedance probabilities, and lower long-term average flows, by approximately 5 percent. Because it is expected that the duration of diversion of excess flows to fill Sites Reservoir would be greater for Alternative B, when compared to Alternative A, the period over which reductions in spills would occur would be longer, generally in the period of December through April. It is anticipated that the described changes in Yolo Bypass flows and outflow would not have a substantial impact on surface water quality. Therefore, water quality impacts to the Yolo Bypass resulting from implementation of Alternative B are considered to be **less than significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperature modeling was not performed for the Sutter Bypass and the Yolo Bypass. However, as described above, the expected changes in spills to the Sutter Bypass represent only a portion of the input to the bypass, and flows into and out of the Yolo Bypass are expected to decrease slightly. Therefore, it is anticipated that implementation of Alternative B would have a **less-than-significant impact** on water temperature in the Sutter Bypass and Yolo Bypass, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento-San Joaquin Delta

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicates that implementation of Alternative B, when compared to Existing Conditions, would result in slightly elevated EC levels during March through May of up to 1.1 percent. Modeled water year type average monthly EC values indicate similar trends, with the greatest expected increase (3.7 percent) occurring in March of Below Normal water years.

During May in Critical water years, an increase of 2.8 percent is expected to occur from approximately 828 µmhos/cm with Existing Conditions to approximately 851 µmhos/cm with Alternative B.

To verify if the minor increases in average EC levels expected in April and May with implementation of Alternative B would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that monthly average EC in April would exceed the 450 µmhos/cm Wet water year standard less than four percent of the years with both Alternative B and Existing Conditions. Similarly, the monthly average EC in April with both Existing Conditions and Alternative B would exceed the 630 µmhos/cm Above Normal water year standard approximately one percent of the years, and all of the years would be well under the 1,140 µmhos/cm Below Normal water year standard. During May, both Alternative B and Existing Conditions would exceed 450 µmhos/cm in approximately 14 percent of the years, exceed 630 µmhos/cm in six percent of the years, and exceed 1,140 µmhos/cm in approximately four percent of the years. In all of the years, the May monthly average EC would be less than the 1,670 µmhos/cm Dry water year standard. Therefore, in terms of compliance with D-1641 salinity standards at Emmaton, Alternative B is expected to perform similar to Existing Conditions.

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicate that Alternative B, when compared to the No Project/No Action Alternative, would result in decreased EC levels during June through January and elevated EC levels during February through May (up to 3.4 percent). Modeled water year type monthly average EC values indicate similar trends. The largest increase in average EC is expected to occur in February in Critical water years, where the EC would increase by 15.8 percent from approximately 404 µmhos/cm with the No Project/No Action Alternative to approximately 467 µmhos/cm with Alternative B.

To verify if the minor increases in average EC levels expected in the April and May months with implementation of Alternative B would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than four percent of the years with both Alternative B and the No Project/No Action Alternative. Similarly, the monthly average EC in April with both the No Project/No Action Alternative and Alternative B would exceed 630 µmhos/cm in one percent of the years, and all of the years would be well under 1,140 µmhos/cm. For May, both Alternative B and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately 15 percent of the years, exceed 630 µmhos/cm in eight percent of the years, and exceed 1,140 µmhos/cm in approximately four percent of the years. In all of the years, the May monthly average EC would be less than 1,670 µmhos/cm.

Therefore, in terms of compliance with D-1641 salinity standards at Emmaton, Alternative B is expected to perform similar to the No Project/No Action Alternative.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location indicate that Alternative B, when compared to Existing Conditions, would result in lower EC levels during all months except November, where EC is expected to increase by two percent. Modeled water year type average monthly EC values for Alternative B indicate lower EC values, when compared to Existing Conditions, during January through August months in all but Critical water years, and higher EC values during September through December by up to 33.2 percent in Wet and Above Normal water years. In Below Normal and Dry water years, the average EC values with implementation of Alternative B would be lower or similar to Existing Conditions in all months. In Critical water years, the average EC with implementation of Alternative B would be lower or similar to Existing Conditions in June through August, October, December, and January, and higher in September, November, and February through May months by up to 3.8 percent.

To verify if the minor increases in average EC levels associated with implementation of Alternative B would impact compliance with D-1641 salinity standards at Jersey Point, exceedance probability plots of the monthly average EC values for Alternative B were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than one percent of the years with both Alternative B and Existing Conditions, and all of the years would be well under 740 µmhos/cm. Similarly, the monthly average EC in May with both Existing Conditions and Alternative B would exceed 450 µmhos/cm in approximately five percent of the years, would exceed 740 µmhos/cm in approximately three percent of the years, and all of the years would be well under 1,350 µmhos/cm. For June, July, and August, the number of years that Alternative B would exceed the compliance standards at Jersey Point would be similar to or lower than Existing Conditions. Therefore, in terms of compliance with D-1641 salinity standards at Jersey Point, Alternative B would perform similar to Existing Conditions.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location with implementation of Alternative B, when compared to the No Project/No Action Alternative, indicate similar or lower EC levels during June through October, December, and January, and higher EC levels during November and February through May, where EC is expected to increase by up to 4.2 percent. Modeled water year type average monthly EC values for Alternative B indicate similar or decreased EC values, when compared to the No Project/No Action Alternative, during most months of all water year types, with increased EC values during September through December by up to 24.1 percent in Wet years. In Above Normal years, EC levels with Alternative B are expected to be lower or similar in March through September, with increased EC levels in other months by up to 30.6 percent, when compared to the No Project/No Action Alternative. In Below Normal and Dry years, the average EC values with implementation of Alternative B are expected to be lower or similar to the No Project/No Action Alternative in the most months. February through April are expected to have slightly elevated EC levels of up to 1.9 percent with implementation of Alternative B, when compared to the No Project/No Action Alternative in Below Normal years. In Dry years, the average EC levels with Alternative B are expected to increase by up to 3.3 percent, when compared to the No Project/No Action Alternative, in April, November, and December. In Critical years, the average EC with Alternative B is expected to be lower than the No Project/No Action Alternative in June, July, October, and December and higher in the remaining months by up to 17.6 percent.

To verify if the minor increases in the average EC levels expected in April and May with implementation of Alternative B would impact compliance with D-1641 standards at Jersey Point, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. As indicated in the EC exceedance plots, the monthly average EC in April would exceed 450 µmhos/cm in approximately 0.5 percent of the years with both Alternative B and the No Project/No Action Alternative, and all of the years are expected to be well under 740 µmhos/cm. For May, both Alternative B and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately 4 percent of the years, exceed 740 µmhos/cm in 3 percent of the years, and in all of the years, the May monthly average EC would be less than 1,350 µmhos/cm. For June, July, and August, the number of years that Alternative B would exceed the compliance standards at Jersey Point would be similar to or lower than those of the No Project/No Action Alternative. Therefore, in terms of the compliance with D-1641 salinity standards at Jersey Point, Alternative B would perform similar to the No Project/No Action Alternative.

As described for Alternative A, implementation of Alternative B would provide supplemental Delta outflow during summer and fall months (May through December) to improve X2 position and increase estuarine habitat. Similar to Alternative A, modeling results indicate that implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would result in eastward movement of X2 by up to 0.9 km in January through May, and a westward movement of X2 by up to 1.4 km in June through November, on a long-term average basis. In Wet years, the average X2 position with implementation of Alternative B would move eastward in October through May by up to 0.5 km, and would move up to 1.2 km westward in June through September, when compared to Existing Conditions and the No Project/No Action Alternative. In Above Normal years, the average X2 position with Alternative B would move eastward in December through May by up to 0.9 km, and would move up to 1.8 km westward in June through October, when compared to Existing Conditions and the No Project/No Action Alternative. In Below Normal and Dry years, the average X2 position with Alternative B would move eastward in January through May by up to 1.7 km, and would move up to 1.8 km westward in June through December, when compared to Existing Conditions and the No Project/No Action Alternative. In Critical years, the average X2 position with Alternative B would move eastward in February through May and November by up to 0.4 km, and would move up to 1.6 km westward in June through January, when compared to Existing Conditions and the No Project/No Action Alternative.

Even though modeling results for the average X2 position in the February through June D-1641compliance period indicate slight eastward movement, Alternative B would comply with the D-1641 spring X2 position requirements. During the September through November compliance period, the monthly average X2 position with implementation of Alternative B would be at or westward of the X2 position for Existing Conditions and the No Project/No Action Alternative.

Similar to Alternative A, implementation of Alternative B would generally improve Delta salinity conditions in the summer and fall months, which are the peak salinity intrusion periods, with minor increased EC levels in the winter and spring months. Compliance with Delta salinity standards with implementation of Alternative B would be consistent with Existing Conditions and the No Project/No Action Alternative. Alternative B would comply with the X2 standards for both spring and fall. Salinity conditions at the Emmaton and Jersey Point compliance locations, and X2 location, are good indicators of the salinity conditions in the Delta. Therefore, implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the salinity conditions in the Delta. EC is a good indicator of other water quality constituents in the Delta. Therefore, implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the other water quality constituents in the Delta.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for the Delta, and there are no specific water temperature criteria in the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB, 2006). However, as described for Alternative A, water temperatures in the Delta approach equilibrium temperatures where the meteorological conditions primarily influence the water temperatures. Thus, the differences between Alternative B and Existing Conditions and the No Project/No Action Alternative would be minimized. Therefore, implementation of Alternative B would results in a **less-than-significant impact** on water temperatures in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Similar to Alternative A, model simulations for Delta outflow indicate that implementation of Alternative B would result in increased average monthly outflow in the summer and fall months, when conditions are relatively Dry, and small reductions in Delta outflow in the winter and spring months when the conditions are Wet, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, these changes would result in a **less-than-significant impact** to the water quality conditions in Suisun Bay, San Pablo Bay, and San Francisco Bay with the implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for Suisun Bay, San Pablo Bay, or San Francisco Bay, and there are no specific water temperature criteria in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB, 2006). However, based on the seasonal flow changes described above with the implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, and because temperatures in Suisun Bay, San Pablo Bay, and San Francisco Bay are primarily controlled by the meteorological conditions, the impacts to water temperature would be **less than significant**.

7.3.7.3 *Primary Study Area – Alternative B*

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to surface water quality and water temperature:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard

- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprints or construction disturbance areas of Sites Reservoir Dams, the Road Relocations and South Bridge, the Delevan Transmission Line, and the Project Buffer would differ from Alternative A. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2**) as described for Alternative A.

Alternative B would include a 1.81-MAF Sites Reservoir. The larger size of the facility footprint would not change the type of construction and maintenance activities that were described for Alternative A, but would result in changes in operation. The Holthouse Reservoir Complex footprint would not change between alternatives, and would, therefore, require the same type of construction and maintenance activities that were described for Alternative A. However, changes in the operation of Sites Reservoir would affect operation of Holthouse Reservoir. The Delevan Pipeline Intake Facilities (that are included in Alternative A) would be replaced by the release-only Delevan Pipeline Discharge Facility in Alternative B. Potential differences in operational impacts to Sites Reservoir and Holthouse Reservoir water quality resulting from the operation of a 1.81-MAF Sites Reservoir, as well as potential differences in impacts from the construction, operation, and maintenance of the Delevan Pipeline Discharge Facility, are discussed below.

Sites Reservoir Inundation Area

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Refer to the **Impact SW Qual-1** Alternative B Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on surface water quality. Implementation of Alternative B is expected to result in a worst-case long-term average EC of 180 to 183 µmhos/cm in Sites Reservoir, which is lower than the expected long-term average associated with implementation of Alternative A. Fall months would have slightly lower EC levels, when compared to spring months, when Sites Reservoir would be filled with water from the Sacramento River. Modeled water year type averages indicate that average worst-case EC levels would range from approximately 179 µmhos/cm in fall months of Above Normal years to 186 µmhos/cm in spring months of Critical years. Based on the above model observations, releases from the reservoir into Funks and Stone Corral creeks, as well as releases into the T-C and GCID canals, would have average worst-case EC levels that fall well below the Ag Goal that is protective of agricultural water uses. Therefore, implementation of Alternative B would result in a **less-than-significant impact** in the receiving waters affected by releases from Sites Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality issues, including sedimentation, eutrophication, oxygen depletion, and chemical transformations within the water column were not modeled, and are, therefore, considered to be **potentially significant** with implementation of Alternative B.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-2** Alternative B Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperature. That discussion of Sites Reservoir release temperatures is applicable to release temperatures in Funks and Stone Corral creeks, as well as to the T-C and GCID canals.

Holthouse Reservoir Complex

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Similar to Alternative A, a comparison between Alternative B modeled EC levels for Funks Reservoir with Existing Conditions and the No Project/No Action Alternative indicate that these levels would increase by up to 34.3 percent during all months of all water year types. These increases in EC are expected to be greatest during the summer and fall months when flow is generally released from Sites Reservoir for agricultural use. Funks Reservoir and the Holthouse Reservoir Complex would be hydrologically connected, so EC levels for Holthouse Reservoir would be the same as described for Funks Reservoir.

Despite these large increases, EC levels would fall below the Ag Goal that is protective of agricultural water uses. Water quality impacts, based on modeled EC conditions with implementation of Alternative B, would therefore, be **less than significant**, when compared to Existing Conditions and No Project/No Action Alternative.

Based on EC modeling results as an indicator of general water quality conditions, impacts associated with operation of this facility would be **less than significant**, when compared to Existing Conditions and No Project/No Action Alternative.

The following water quality issues have not been estimated for this analysis: sedimentation, eutrophication, oxygen depletion, and chemical transformations within the water column. These water quality issues would, therefore, have a **potentially significant impact** with implementation of Alternative B, when compared to Existing Conditions and No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

These facilities would act as regulating reservoirs for Sites Reservoir. Refer to the **Impact SW Qual-2** Alternative B Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on surface water temperatures.

Delevan Pipeline Discharge Facilities

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

The Delevan Pipeline Discharge Facility would be capable of releases to only the Sacramento River. The discharge facility would not extend into the river channel as described for the Delevan Pipeline Intake Facilities, but would still require the installation of a cellular sheet pile cofferdam extending approximately eight feet into the river. The cofferdam would likely remain in place throughout the duration of facility construction. The area behind the cofferdam would be dewatered prior to construction by pumping water out from behind the cofferdam. After construction of the pump station is complete, the cofferdam would be removed by pulling the sheet piles out of the river and restoring the river to its previous condition. These construction activities would result in ground-disturbing activities, the temporary diversion of surface waters around construction sites, and could result in increased erosion or sediment deposition. These construction activities would have a **potentially significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

The discharges from this facility would contribute to the worst-case EC levels in the Sacramento River. Refer to the **Impact SW Qual-1** Alternative B Secondary Study Area discussion for Sacramento River water quality impacts associated with these discharges. The discharge-only facility would not require sediment removal, as was described for the Alternative A Delevan Pipeline Intake Facilities. Routine maintenance activities for this facility would, therefore, have a **less-than-significant impact** to water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-2** Alternative B Secondary Study Area discussion for Sacramento River temperature impacts associated with releases from this facility.

7.3.8 Impacts Associated with Alternative C

7.3.8.1 *Extended Study Area – Alternative C*

<u>Construction, Operation, and Maintenance Impacts</u>

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Comparison of the modeled long-term average EC levels for Alternative C and Existing Conditions at Clifton Court Forebay indicates that EC levels are expected to decrease by up to 10.1 percent in all months. Comparing the water year type averages, EC levels for Alternative C would be reduced in nearly all months of all water year types. Increases of up to 5.8 percent are expected in November and December of Above Normal years. The modeled long-term average and water year type average EC levels at the Jones Pumping Plant with implementation of Alternative C, when compared to Existing Conditions would be similarly reduced, with the exception of negligible increases of up to 2.5 percent in November of Above Normal years.

Comparison of the modeled long-term average EC levels for Alternative C and the No Project/No Action Alternative at Clifton Court Forebay indicates that EC levels are expected to decrease or remain similar in all months. Comparing the water year type averages, EC levels with implementation of Alternative C are expected to increase by up to 2.5 percent in December, February through May, and July in Wet years.

EC levels are also expected to increase by up to 7.3 percent in November through July in Above Normal years; by up to 0.8 percent in February, April, and May of Below Normal years; by up to 0.6 percent in April through June in Dry years; and by up to 0.6 percent in December of Critical years. The modeled long-term average EC levels at the Jones Pumping Plant with implementation of Alternative B are also expected to be lower or similar to the No Project/No Action Alternative in most months, with negligible increases of up to 0.5 percent expected in March through June. Comparing the water year type averages, EC levels with implementation of Alternative C at the Jones Pumping Plant are expected to increase similarly to those described for Clifton Court Forebay, but would experience negligible increases in EC levels during more months in Below Normal, Dry, and Critical years.

Similar to Alternatives A and B, modeling results indicate that Alternative C is expected to reduce the long-term average export-weighted EC, TDS, chloride, and bromide concentrations, when compared to Existing Conditions and the No Project/no Action Alternative. Similarly, the Dry and Critical year average export-weighted concentrations are expected to decrease with Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative.

Although minor increases in EC levels are expected with implementation of Alternative C, the largest of all the increases are expected to occur in November, and December during Above Normal years, which have relatively wetter conditions. The resulting increased EC levels for Above Normal years for these months are highest in December (up to 414 µmhos/cm). These modeled increases in EC levels are, therefore, expected to be below the Ag Goal and drinking water goal.

Therefore, implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative would have a **less-than-significant impact** on EC levels, TDS, bromide, and chloride concentrations associated with agricultural, municipal, industrial, and wildlife refuge water supply.

Other water quality parameters, such as metals and nutrients, were not modeled as part of this analysis. The potential changes to the concentrations of these constituents are unknown at this time. However, the overall improvements in EC levels with Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, are expected to translate into improvements in the concentrations of these constituents. Therefore, implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the concentrations of nutrients, metals, and other water quality constituents, including mercury, associated with the deliveries for agricultural, municipal, industrial, and wildlife refuge use.

San Luis Reservoir

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Implementation of Alternative C would result in continued water level fluctuations at San Luis Reservoir and minor decreases in end-of-month long-term average surface water elevations of up to eight feet in May through October, when compared to Existing Conditions. A comparison of water year type averages indicates an increase in elevation of up to eight feet during all months in Below Normal and Critical years. During Dry years, increases of up to three feet are expected in January through April. Elevations would, therefore, be improved during periods in which algae blooms are a concern, with the exception of decreases of up to 14 feet during May through December in Dry years.

Modeled end-of-month long-term average surface water elevations for Alternative C, when compared to the No Project/No Action Alternative, indicate decreases of up to five feet during May through September. These decreases in surface water elevation fall within the historic range of operation for San Luis Reservoir. A comparison of water year type averages indicates an increase of up to nine feet in all months of Below Normal years. Elevations are expected to decrease up to 20 feet in all months in Dry and Critical years.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet in 100 percent of the years in December through May with both Alternative C and Existing Conditions. Alternative C would perform similarly to Existing Conditions in June through August, and would perform within an approximate three percent difference in September through November.

End-of-month storage exceedance plots indicate that San Luis Reservoir would exceed 250,000 acre-feet in 100 percent of the years in December through May with both Alternative C and the No Project/No Action Alternative. Alternative C would perform similarly to the No Project/No Action Alternative in June and July. And Alternative C and the No Project/No Action Alternative would perform within an approximate three percent difference in August through November.

Even with the expected decreases in surface water elevations associated with implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, the end-of-month storage exceedances of 250,000 acre-feet would be similar or improved with Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, operational changes at San Luis Reservoir would be expected to have a **less-than-significant impact** on nuisance algae blooms, when compared to Existing Conditions and the No Project/No Action Alternative.

The impact findings for the Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use water quality conditions are directly applicable to San Luis Reservoir. Therefore, implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on EC levels, TDS, bromide and chloride concentrations, metals, nutrients, and other water quality constituents in the San Luis Reservoir.

7.3.8.2 *Secondary Study Area – Alternative C*

Construction, Operation, and Maintenance Impacts

Implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would result in improved storage conditions similar to those described for Alternative A at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. In addition, Whiskeytown Lake, Lewiston Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma would continue to operate as regulating reservoirs within their historical operational range, as described for Alternative A. Therefore, the impact of Alternative C on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2**) within these reservoirs would be the same as described for Alternative A. Modeling results show that releases from these reservoirs into the Trinity River, Klamath River downstream of the Trinity River, Clear Creek, Spring Creek, the Feather River, and the American River would also have similar impacts on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2**) as described for Alternative A.

Construction, operation, and maintenance activities at the Red Bluff Pumping Plant would be the same with implementation of Alternative C as described for Alternative A, and would, therefore, have the same impacts on surface water quality (**Impact SW Qual-1**) and water temperature (**Impact SW Qual-2**) as described for Alternative A.

Alternative C would include a 1.81-MAF Sites Reservoir (as was described for Alternative B) and the Delevan Pipeline Intake Facilities (as was described for Alternative A). This combination of storage and diversion capacity would result in operational effects to downstream Project facilities that differ slightly from those described for Alternative A. Therefore, the operational impacts of Alternative C on surface water quality and water temperatures for the remaining Project facilities in the Secondary Study Area are described below.

Sacramento River

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Implementation of Alternative C would have effects on Sacramento River EC levels upstream of the Delevan Pipeline location similar to those described for Alternatives A and B because the long-term average worst-case EC estimated at the T-C Canal Intake with implementation of Alternative C for the Sacramento River reach between Keswick and Red Bluff is expected to decrease or remain similar in all months, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, the worst-case EC estimated at the GCID Canal Intake for the reach between Red Bluff and Hamilton City is expected to remain similar in most of the months with Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative. The worst-case EC levels for the Sacramento River reach between the GCID Canal Intake and the Delevan Pipeline Intake location indicate similar trends as the upstream reaches, when comparing Alternative C to Existing Conditions and the No Project/No Action Alternative.

However, downstream of the Delevan Pipeline Intake location, worst-case EC levels in the Sacramento River would differ slightly with implementation of Alternative C, when compared to Alternatives A and B, because Alternative C includes a 1.81-MAF Sites Reservoir and three intakes. Similar to Alternative A, long-term average worst-case EC levels in the Sacramento River are expected to increase in all months with implementation of Alternative C, and increase in most months in all water year types, when compared to Existing Conditions and the No Project/No Action Alternative. However, the increases associated with Alternative C are expected to be greater than those described for the other alternatives, with the largest of the increases expected to occur in April (up to 5.4 percent) and October (up to 8.2 percent).

The EC levels for the Sacramento River reach from the CBD to the entrance of the Delta at the I Street Bridge were not estimated explicitly. However, the changes in the EC levels in this reach are expected to trend consistently with the changes found in the upper Sacramento River reaches.

The increased EC levels with implementation of Alternative C are a result of reduction in the flows released from the Shasta Reservoir. Further, in the winter and spring months, the increased diversions at the three intakes to fill the Sites Reservoir would contribute to increased EC levels in the Sacramento River. In the summer and fall months, releases from Sites Reservoir would also cause EC levels to increase in the Sacramento River reach downstream of the Delevan Pipeline Intake Facilities. However, the water year type averages for the worst-case EC levels with implementation of Alternative C, in all months, are expected to be below the Central Valley Basin Plan requirement of 230 µmhos/cm for the Sacramento River reach upstream of the CBD.

Therefore, the minor increases in the worst-case EC levels can be considered negligible, and the impacts to Sacramento River EC levels due to the implementation of the Alternative C would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality constituents of concern, including mercury and unknown toxicity on the 303(d) list of impaired waters, were not evaluated explicitly. However, the changes in the concentrations of the other water quality constituents are expected to be proportional to the changes in the worst-case EC levels with implementation of Alternative C from Existing Conditions and the No Project/No Action Alternative. Therefore, the impact on the water quality constituents in the Sacramento River due to the implementation of Alternative C would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Similar to Alternative A for the Sacramento River reach from Keswick to downstream of the Delevan Pipeline Intake Facilities, modeling results indicate that Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would result in similar or decreased water temperatures in summer and fall months of Below Normal, Dry, and Critical water year types when the ambient temperatures are higher. In April, Alternative C would result in slightly elevated water temperatures of up to 1.9 percent in all water year types.

Downstream of the Delevan Pipeline Intake Facilities, results based on preliminary temperature modeling of the Alternative C Sites Reservoir would be similar to Alternative A.

Modeling results for water temperatures in the Sacramento River at Knights Landing indicate that implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would result in negligible changes in all months of all water year types, with the greatest increase of up to 0.6 percent expected in April in all water year types. Similar to Alternative A, comparison of the average water temperatures for Alternative C to Existing Conditions and the No Project/No Action Alternative at the Freeport location indicates that the temperatures would be similar or lower in summer and fall months of all water year types. For the winter and spring months (December through May), the resulting average temperatures with implementation of Alternative C would be slightly elevated by up to 0.6 percent in all water year types, when compared to Existing Conditions and the No Project/No Action Alternative.

Modeled average monthly temperatures by water year type for Alternative C indicate that the 68°F criterion for July through November from Hamilton City to the I Street Bridge would be exceeded at Knights Landing during all water year types, and at the Feather River and American River during all but Above Normal years. However, it is important to note that the criterion is already exceeded with Existing Conditions and the No Project/ No Action Alternative at these locations, and implementation of Alternative C would result in decreased temperatures.

Based on the above model observations, implementation of Alternative C would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, for the Sacramento River temperature for the reach between Keswick and the I Street Bridge.

Sutter Bypass and Yolo Bypass

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

As described for Alternative A, Alternative C would be operated to divert excess Sacramento River flows from November through March to fill Sites Reservoir and would potentially reduce flows by up to 5,900 cfs in the Sutter and Yolo bypasses. Changes in operations associated with integrated operations of Sites Reservoir with Shasta Lake may also influence the frequency and magnitude of flows in the Sutter and Yolo bypasses. Because of the increased capacity of Sites Reservoir with Alternative C, when compared to Alternative A, it is expected that the frequency of diversion of excess flows to fill Sites Reservoir would be greater for Alternative C than with Alternative A.

Similar to Alternative A, monthly average exceedance probability plots indicate that spills for Alternative C would be the same or similar in frequency of spills for Existing Conditions at Ord Ferry, Moulton Weir, and Colusa Weir. Exceedance probability plots for Alternative C, when compared to the No Project/No Action Alternative, would be similar in frequency of spills.

Similar to Alternative A, the spills for Alternative C, when compared to Existing Conditions, would vary from minor increases to decreases during high flow months when the weirs are spilling. Although the overall frequency of spills would be similar to those of Existing Conditions, the long-term average volume of spill for Alternative C when compared to Existing Conditions would decrease by approximately 8 percent at Tisdale Weir and 5 percent at Colusa Weir, generally in the period of December through March. Exceedance probability plots for Alternative C, when compared to the No Project/No Action Alternative, show similar expected decreases in the volume of spills.

Spills into the Sutter Bypass from the Sacramento River represent only some of the hydrologic inputs to the lower Sutter Bypass. Similar to Alternative A, it is anticipated that the changes in spill exceedance probabilities discussed above would not have a substantial impact on surface water quality in the Sutter Bypass. Therefore, it is concluded that implementation of Alternative C would result in a **less-than-significant impact** on surface water quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Similar to Alternative A, monthly average exceedance probability plots of Yolo Bypass flows with implementation of Alternative C, when compared to Existing Conditions, indicate lower similar exceedance probabilities and lower long-term average flows by approximately 7 percent, generally in the period of December through March. It is anticipated that the described changes in Yolo Bypass flows and outflow would not have a substantial impact on surface water quality. Therefore, water quality impacts to the Yolo Bypass resulting from implementation of Alternative C are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperature modeling was not performed for the Sutter Bypass and the Yolo Bypass. However, as described above, the expected changes in spills to the Sutter Bypass represent only a portion of the input to the bypass, and flows into and out of the Yolo Bypass are expected to decrease slightly. Therefore, it is anticipated that implementation of Alternative C would have a **less-than-significant impact** on water temperature in the Sutter Bypass and Yolo Bypass, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento-San Joaquin Delta

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicates that implementation of Alternative C, when compared to Existing Conditions, would result in slightly elevated EC levels during March through May of up to 1.2 percent. Modeled water year type average monthly EC values indicate similar trends, with the greatest expected increase (3.3 percent) occurring in March of Below Normal water years.

During May in Critical years, an increase of 3.4 percent is expected to occur from approximately 828 µmhos/cm with Existing Conditions to approximately 856 µmhos/cm with Alternative C.

To verify if the minor increases in average EC levels expected in April and May with implementation of Alternative C would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that monthly average EC in April would exceed the 450 µmhos/cm Wet year standard less than 4 percent of the years with both Alternative C and Existing Conditions. Similarly, the monthly average EC in April with both Existing Conditions and Alternative C would exceed the 630 µmhos/cm Above Normal water year standard approximately 1 percent of the years, and all of the years would be well under the 1,140 µmhos/cm Below Normal water year standard. During May, both Alternative C and Existing Conditions would exceed 450 µmhos/cm in approximately 14 percent of the years, exceed 630 µmhos/cm in 7 percent of the years, and exceed 1,140 µmhos/cm in approximately 4 percent of the years. In all of the years, the May monthly average EC would be less than the 1,670 µmhos/cm Dry water year standard. Therefore, in terms of compliance with D-1641 salinity standards at Emmaton, Alternative C is expected to perform similar to Existing Conditions.

Modeled long-term average monthly EC results for the Sacramento River at Emmaton compliance location indicate that Alternative C, when compared to the No Project/No Action Alternative, would result in decreased EC levels during June through December and elevated EC levels during January through May (up to 4.8 percent). Modeled water year type monthly average EC values indicate similar trends. The largest increase in average EC is expected to occur in February in Critical water years, where the EC would increase by 20.5 percent, from approximately 404 µmhos/cm with the No Project/No Action Alternative to approximately 486 µmhos/cm with Alternative C.

To verify if the minor increases in average EC levels expected in the April and May months with implementation of Alternative C would impact compliance with D-1641 salinity standards at Emmaton, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than four percent of the years with both Alternative C and the No Project/No Action Alternative. Similarly, the monthly average EC in April with both Alternative C and the No Project/No Action Alternative would exceed 630 µmhos/cm in one percent of the years, and all of the years would be well under 1,140 µmhos/cm. For May, both Alternative C and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately 15 percent of the years, exceed 630 µmhos/cm in eight percent of the years, and exceed 1,140 µmhos/cm in approximately four percent of the years. In all of the years, the May monthly average EC would be less than 1,670 µmhos/cm.

Therefore, in terms of compliance with D-1,641 salinity standards at Emmaton, Alternative C is expected to perform similar to the No Project/No Action Alternative.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location indicate that Alternative C, when compared to Existing Conditions, would result in lower EC levels during all months except March, where EC is expected to increase by 0.4 percent. Modeled water year type average monthly EC values for Alternative C indicate lower EC values, when compared to Existing Conditions, during January through August in all but Critical water years, and higher EC values during September through December by up to 36.7 percent in Wet and Above Normal water years. In Below Normal and Dry water years, the average EC values with implementation of Alternative C would be lower or similar to Existing Conditions in all months. In Critical water years, the average EC with Alternative C would be lower or similar to Existing Conditions in June through January and higher in February through May by up to 3.5 percent.

To verify if the minor increases in average EC levels associated with implementation of Alternative C would impact compliance with D-1641 salinity standards at Jersey Point, exceedance probability plots of the monthly average EC values for Alternative C were evaluated and compared to those of Existing Conditions. The EC exceedance plots indicate that the monthly average EC in April would exceed 450 µmhos/cm less than one percent of the years with both Existing Conditions and Alternative C, and all of the years would be well under 740 µmhos/cm. Similarly, the monthly average EC in May with Existing Conditions and Alternative C would exceed 450 µmhos/cm in approximately six percent of the years, would exceed 740 µmhos/cm in approximately three percent of the years, and all of the years would be well under 1,350 µmhos/cm. For June, July and August, the number of years that Alternative C would exceed the compliance standards at Jersey Point would be similar to or lower than Existing Conditions. Therefore, in terms of compliance with D-1641 salinity standards at Jersey Point, Alternative C would perform similar to Existing Conditions.

Modeled long-term average monthly EC results for the San Joaquin River at Jersey Point compliance location with implementation of Alternative C, when compared to the No Project/No Action Alternative, indicate lower EC levels during June through October and December, and higher EC levels during November and January through May, where EC is expected to increase by up to 4.8 percent. Modeled water year type average monthly EC values for Alternative C indicate similar or decreased EC values, when compared to the No Project/No Action Alternative, during most months of all water year types, with increased EC values during September through December by up to 27.7 percent in Wet water years. In Above Normal water years, Alternative C EC levels are expected to be lower or similar in February through September, with increased EC levels in other months by up to 34.1 percent, when compared to the No Project/No Action Alternative. In Below Normal and Dry water years, the average EC values with implementation of Alternative C are expected to be lower or similar to the No Project/No Action Alternative in the most months. February through April are expected to have slightly elevated EC levels of up to 1.7 percent with Alternative C, when compared to the No Project/No Action Alternative in Below Normal water years. In Critical water years, the average EC with Alternative C is expected to be lower than the No Project/No Action Alternative in June, July, October, and December and higher in the remaining months by up to 21.5 percent.

To verify if the minor increases in the average EC levels expected in April and May with implementation of Alternative C would impact compliance with D-1641 standards at Jersey Point, exceedance probability plots of the monthly average EC values were evaluated and compared to the No Project/No Action Alternative. As indicated in the EC exceedance plots, the monthly average EC in April would exceed

450 µmhos/cm in approximately 0.5 percent of the years with both Alternative C and the No Project/No Action Alternative, and all of the years are expected to be well under 740 µmhos/cm. For May, both Alternative C and the No Project/No Action Alternative would exceed 450 µmhos/cm in approximately five percent of the years, exceed 740 µmhos/cm in three percent of the years, and in all of the years, the May monthly average EC would be less than 1,350 µmhos/cm. For June, July and August, the number of years that Alternative C would exceed the compliance standards at Jersey Point would be similar to or lower than those of the No Project/No Action Alternative. Therefore, in terms of the compliance with D-1641 salinity standards at Jersey Point, Alternative C would perform similar to the No Project/No Action Alternative.

As described for Alternative A, implementation of Alternative C would provide supplemental Delta outflow during summer and fall months (May through December) to improve the X2 position and increase estuarine habitat. Similar to Alternative A, modeling results indicate that implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would result in eastward movement of X2 by up to 0.6 km in December through May, and a westward movement of X2 by up to 1.5 km in June through November, on a long-term average basis. In Wet water years, the average X2 position with implementation of Alternative C would move eastward in October through May by up to 0.9 km, and would move up to 1.2 km westward in June through September, when compared to Existing Conditions and the No Project/No Action Alternative. In Above Normal water years, the average X2 position with Alternative C would move eastward in December through May by up to 0.9 km, and would move up to 1.8 km westward in June through October, when compared to Existing Conditions and the No Project/No Action Alternative. In Below Normal and Dry water years, the average X2 position with Alternative C would move eastward in January through May by up to 1.9 km, and would move up to 1.9 km westward in June through December, when compared to Existing Conditions and the No Project/No Action Alternative. In Critical water years, the average X2 position with Alternative C would move eastward in February through May by up to 0.8 km, and would move up to 1.4 km westward in June through January, when compared to Existing Conditions and the No Project/No Action Alternative.

Even though modeling results for the average X2 position in the February through June D-1641compliance period indicate slight eastward movement, Alternative C would comply with the D-1641 spring X2 position requirements. During the September through November compliance period, the monthly average X2 position with implementation of Alternative C would be at or westward of the X2 position for Existing Conditions and the No Project/No Action Alternative.

Similar to Alternative A, implementation of Alternative C would generally improve Delta salinity conditions in the summer and fall months, which are the peak salinity intrusion periods, with minor increased EC levels in the winter and spring months. Alternative C would comply with the X2 standards for both spring and fall. Salinity conditions at the Emmaton and Jersey Point compliance locations and the X2 location are good indicators of the salinity conditions in the Delta. Therefore, implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the salinity conditions in the Delta. EC is a good indicator of other water quality constituents in the Delta. Therefore, implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **less-than-significant impact** on the other water quality constituents in the Delta.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for the Delta, and there are no specific water temperature criteria in the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB, 2006). However, as described for Alternative A, water temperatures in the Delta approach equilibrium temperatures where the meteorological conditions primarily influence the water temperatures. Thus the differences between Alternative C and Existing Conditions and the No Project/No Action Alternative would be minimized. Therefore, implementation of Alternative C would results in a **less-than-significant impact** on water temperatures in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

Suisun Bay, San Pablo Bay, San Francisco Bay

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Similar to Alternative A, model simulations for Delta outflow indicate that implementation of Alternative C would result in increased average monthly outflow in the summer and fall months, in relatively Dry water year conditions, and small reductions in Delta outflow in the winter and spring months, in Wet water year conditions, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, Alternative C would result in a **less-than-significant impact** to the water quality conditions in Suisun Bay, San Pablo Bay, and San Francisco Bay, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Water temperatures were not modeled or evaluated for Suisun Bay, San Pablo Bay, or San Francisco Bay, and there are no specific water temperature criteria in the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB, 2006). However, based on the seasonal flow changes described above with implementation of Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative, and because temperatures in Suisun Bay, San Pablo Bay, and San Francisco Bay are primarily controlled by the meteorological conditions, the impacts to water temperature would be **less than significant**.

7.3.8.3 *Primary Study Area – Alternative C*

<u>Construction, Operation, and Maintenance Impacts</u>

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction, operation, and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to surface water quality and water temperature:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard

- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C Sites Reservoir would be the same size as that described for Alternative B, and the Delevan Pipeline Intake Facilities included with Alternative C would be the same as described for Alternative A. These facilities would, therefore, require the same type of construction and maintenance activities that were described for those alternatives. However, the combination of the 1.81-MAF Sites Reservoir and the Delevan Pipeline Intake Facilities would change Project operation of Sites and Holthouse reservoirs. Therefore, although construction and maintenance impacts associated with the Holthouse Reservoir Complex would be the same as described for Alternative A, operational impacts could differ. The potential differences in impacts to water quality resulting from changes in operations in Sites Reservoir and the Holthouse Reservoir Complex are described below.

Sites Reservoir Inundation Area

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Refer to the **Impact SW Qual-1** Alternative C Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on surface water quality. Implementation of Alternative C is expected to result in a worst-case long-term average EC of 190 to 193 µmhos/cm in Sites Reservoir, which is similar to the expected long-term average associated with implementation of Alternative A, and higher than expected levels with implementation of Alternative B. Fall months show slightly lower EC levels, when compared to spring months, when Sites Reservoir is filled with water from the Sacramento River. Modeled water year type averages indicate that average worst-case EC levels would range from approximately 187 µmhos/cm in fall months of Above Normal water years to 195 µmhos/cm in spring months of Critical water years. Based on the above model observations, releases from the reservoir into Funks and Stone Corral creeks, as well as releases into the T-C and GCID canals, would have average worst-case EC levels that fall well below the Ag Goal that is protective of agricultural water uses. Therefore, implementation of Alternative C would result in a **less-than-significant impact** in the receiving waters affected by releases from Sites Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Other water quality issues, including sedimentation, eutrophication, oxygen depletion, and chemical transformations within the water column were not modeled, and are, therefore, considered to be **potentially significant** with implementation of Alternative C.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

Refer to the **Impact SW Qual-2** Alternative C Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperature. That discussion of Sites Reservoir release temperatures is applicable to release temperatures in Funks and Stone Corral creeks, as well as to the T-C and GCID canals.

Holthouse Reservoir Complex

Impact SW Qual-1: A Violation of any Water Quality Standard or Waste Discharge Requirement, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality

Similar to Alternative A, a comparison between Alternative C modeled EC levels for Funks Reservoir and Existing Conditions and the No Project/No Action Alternative indicates that these levels would increase by up to 39.5 percent during all months of all water years. These increases in EC are expected to be greatest during the summer and fall months. Funks Reservoir and the Holthouse Reservoir Complex would be hydrologically connected, so EC levels for Holthouse Reservoir would be the same as described for Funks Reservoir. Despite these large increases, EC levels would fall below the Ag Goal that is protective of agricultural water uses. Water quality impacts based on modeled EC conditions with implementation of Alternative C would, therefore, be **less than significant**, when compared to Existing Conditions and No Project/No Action Alternative.

Additionally, the following water quality issues have not been estimated for this analysis: sedimentation, eutrophication, oxygen depletion, and chemical transformations within the water column. These water quality issues would have a **potentially significant impact** with implementation of Alternative C, when compared to Existing Conditions and No Project/No Action Alternative.

Impact SW Qual-2: A Violation of any Regulatory Temperature Criteria or Temperature Targets

These facilities would act as regulating reservoirs for Sites Reservoir. Refer to the **Impact SW Qual-2** Alternative C Secondary Study Area discussion for the Sacramento River for the effects of Sites Reservoir diversions and releases on water temperatures.

7.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 7-2 for the impacts that have been identified as significant or potentially significant.

Table 7-2
Summary of Mitigation Measures for
NODOS Project Impacts to Surface Water Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact SW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Surface Water Quality Resulting in Adverse Effects to Designated Beneficial Uses of Surface Water, or Otherwise Substantially Degrade Surface Water Quality				
Impact SW Qual-1a: Reservoir sedimentation, eutrophication, oxygen depletion, and chemical transformation	Sites Reservoir, Funks Reservoir, Holthouse Reservoir, TRR	Potentially Significant	Mitigation Measure SW Qual-1a: Implement a Water Quality Monitoring, Modeling, and Operations coordination Program to Protect Beneficial Uses	Less than Significant
Impact SW Qual-1b: Contamination from inundation of Salt Lake	Sites Reservoir	Potentially Significant	Mitigation Measure SW Qual-1b: Excavate and remove or consolidate and cap Salt Lake	Less than Significant
Impact SW Qual-1c: Soil disturbing activities contributing to erosion and increased turbidity to receiving waters	All Primary Study Area Project facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1c (1): Implement soil stabilization and sediment control BMPs Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Impact SW Qual-1d: Material stockpile management that could adversely affect surface water quality	All Primary Study Area Project Facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1c (1): Implement soil stabilization and sediment control BMPs Mitigation Measure SW Qual-1c (2) Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Impact SW Qual-1e: Hazardous material spills that could adversely affect surface water quality	All Primary Study Area Project Facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant

Table 7-2
Summary of Mitigation Measures for
NODOS Project Impacts to Surface Water Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact SW Qual-1f: Temporary diversion of surface waters that could adversely affect surface water quality	All Primary Study Area Project Facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1f: Implement BMPs including diversion ditches, berms, pipelines, sheet piles, and coffer dams	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
Impact SW Qual-1g: Temporary dewatering of shallow groundwater	Sites Reservoir Dams, Road Relocations, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, TRR, TRR Pipeline, TRR Pumping/Generating Plant, TRR to Funks Creek Pipeline, GCID Connection to TRR, Delevan Pipeline, Delevan Pipeline Intake/Discharge Facilities	Potentially Significant	Mitigation Measure SW Qual-1g: Implement Caltrans Field Guide to Construction Site Dewatering	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
Impact SW Qual-1h: Concrete waste that could adversely affect surface water quality	All Primary Study Area Project facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1h: Implement concrete waste management BMPs	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
Impact SW Qual-1i: Vehicle and equipment cleaning activities that could adversely affect surface water quality	All Primary Study Area Project facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1i: Implement vehicle and equipment cleaning procedures and practices	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	

Table 7-2
Summary of Mitigation Measures for
NODOS Project Impacts to Surface Water Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact SW Qual-1j: Vehicle and equipment fueling activities that could adversely affect surface water quality	All Primary Study Area Project facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1j: Implement vehicle and equipment fueling procedures and practices	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
Impact SW Qual-1k: Vehicle and equipment maintenance activities that could adversely affect surface water quality	All Primary Study Area Project facilities except the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure SW Qual-1k: Implement appropriate vehicle and equipment maintenance procedures and practices	Less than Significant
			Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	
Impact SW Qual-1l: Pile driving activities that could adversely affect surface water quality	Sites Reservoir and Dams, Road Relocations, Sites Pumping/Generating Plant, Sites Tunnel, Sites Reservoir Inlet/Outlet Structure, Holthouse Reservoir Complex, Terminal Regulating Reservoir, TRR Pipeline, TRR Pumping/Generating Plant, TRR to Funks Creek Pipeline, GCID Connection to TRR, Delevan Pipeline, Delevan Pipeline Intake/Discharge Facilities	Potentially Significant	Mitigation Measure SW Qual-1l: Implement appropriate pile driving procedures and practices	Less than Significant
			Mitigation Measure SW-Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	

Note:
LOS = Level of Significance

Mitigation Measure SW Qual-1a: Implement a Water Quality Monitoring, Modeling, and Operations Coordination Program to Protect Beneficial Uses

A comprehensive water monitoring program, including analysis of water quality conditions at the Project intake/discharge locations on the Sacramento River, as well as major Project conveyance and impoundment features, shall be implemented. This monitoring program shall include a network of automated real-time water monitoring locations at these locations, with data available to operators on the SCADA control system to allow real-time adaptive alteration in diversion amounts based on these conditions. This would allow operators to select the best quality waters to fill Sites Reservoir and potentially avoid importation of poor quality water that may affect the quality of Project water deliveries. This strategy could require additional modeling of Project water quality conditions to better understand the complex chemical interactions and physical and biological processes that affect contaminant levels. In addition, fish in Sites Reservoir shall be sampled and analyzed for mercury and other potential contaminants that may have deleterious effects to human and wildlife consumers. Results from these analyses shall be submitted to the Office of Environmental Health Hazard Assessment (OEHHA) for determination of the threats to consumers of fish in Sites Reservoir. Determination of adverse health effects to consumers would lead to educational postings at access points and public media to reduce exposure to contaminated fish.

Mitigation Measure SW Qual-1b: Excavate and Remove or Consolidate and Cap Salt Lake

The Salt Lake site within the footprint of Sites Reservoir for Alternatives A, B, and C would be either excavated and removed or consolidated and capped by an impermeable cover to avoid dissolution of the salt deposit into the reservoir waters. Salt Lake is fed by upslope salt springs, is many decades old, and the salt pan has accumulated to an unknown thickness over this time by evaporation. After removal/capping of the salt pan, the salt spring inputs to a completed Sites Reservoir would be diluted by high quality Sacramento River imports to a level that would be less than significant to water quality.

Mitigation Measure SW Qual-1c (1): Implement Soil Stabilization and Sediment Control BMPs

During construction activities, onsite monitoring shall be performed to identify runoff impacts. Appropriate soil stabilization BMPs; such as hydroseeding and application of other soil binders; installation of culverts, pipelines, and lined ditches to divert stormwater around disturbed soil areas; dust suppression through application of water to unpaved access roads; and placing cover material over material stockpiles; shall be implemented to reduce potentially significant construction impacts from erosion to a less-than-significant level. Sediment control BMPs, such as installation of fiber rolls and straw bales, settling/desilting basins, and other control measures, shall be implemented to reduce potentially significant construction impacts to surface water quality (suspended sediment and turbidity) and drainage to a less-than-significant level. Details of these BMPs are described in Section WM-3 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan

The Project is subject to construction-related stormwater permit requirements of the Clean Water Act National Pollutant Discharge Elimination System (NPDES) Permit Program. DWR and Reclamation shall obtain any required permits through the CVRWQCB before any ground-disturbing construction activities occur. DWR and Reclamation shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that identifies BMPs to prevent or minimize the introduction of contaminants into surface waters. BMPs for the Project could include, but are not limited to, silt fencing, straw bale barriers, diversion ditches, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrance. The SWPPP shall include development of site-specific structural and operational BMPs to prevent and control impacts on runoff quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means.

Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan

DWR and Reclamation shall prepare and implement a SWPPP that emphasizes proper hazardous materials storage and handling procedures; shall outline spill containment, cleanup, and reporting procedures; and shall limit refueling and other hazardous activities to designated upland areas. Signs prohibiting refueling shall be posted in sensitive areas. Equipment shall be inspected prior to use each day to ensure that hydraulic hoses are tight and in good condition. Other appropriate BMPs, such as use of concrete washout basins and proper waste management, combined with visual observation and water sample collection and analysis, shall be used to prevent discharge of drilling mud and other chemicals associated with construction activities and into receiving waters. Details of these BMPs are described in Section WM-4 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1f: Implement BMPs including Diversion Ditches, Berms, Pipelines, Sheet Piles, and Cofferdams

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream from a Project site, transport it around the work area, and discharge it downstream from the work area with minimal water quality degradation. Clear water diversions shall be used during construction at all Primary Study Area Project Facilities except the GCID Canal Facilities Modifications, and shall be included in the SWPPP. Structures used as part of this system shall include some or all of the following: diversion ditches, berms, dikes, slope drains, pipelines, rock, gravel bags, wood, sheet piles, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes. Details of these BMPs are described in Section NS-5 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1g: Implement Caltrans Field Guide to Construction Site Dewatering

Effluent from dewatering activities shall be properly stored and disposed of to prevent contamination of surface water. This measure is intended to prevent the discharge of pollutants from construction site dewatering operations associated with stormwater (accumulated rain) and non-stormwater (e.g., groundwater or water from a diversion or cofferdam). Dewatering effluent that is discharged from a construction site to a storm drain or receiving water is subject to the requirements of the applicable NPDES Permit. Detailed guidance for management of dewatering operations is included in the *Caltrans Field Guide to Construction Site Dewatering* (Caltrans, 2001). The dewatering effluent shall be managed according to Central Valley RWQCB requirements and California Stormwater Quality Association BMPs.

Mitigation Measure SW Qual-1h: Implement Concrete Waste Management BMPs

Concrete waste management procedures and practices shall be implemented during construction of all Project facilities except the GCID Canal Facilities Modifications, where the following conditions exist: where concrete is used as a construction material or where concrete dust and debris would result from demolition activities; where slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition; and where concrete trucks and other concrete-coated equipment are washed on-site. Concrete waste management procedures and practices shall include some or all of the following: placing temporary berms or sandbags to contain concrete slurry wastes; constructing temporary concrete washout facilities, consisting of pits or berms with sufficient volume to contain all concrete waste from concrete truck washout procedures; regular inspection and maintenance of these BMPs; and proper disposal of hardened concrete wastes and backfill of removed concrete waste facilities after construction activities are complete. Details of these BMPs are described in Section WM-8 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1i: Implement Vehicle and Equipment Cleaning Procedures and Practices

Vehicle and equipment cleaning procedures and practices shall be used to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain systems or to watercourses. On-site vehicle and equipment washing shall be discouraged. The use of solvents shall be minimized and the use of diesel for vehicle and equipment cleaning shall be prohibited. Details of these BMPs are described in Section NS-8 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1j: Implement Vehicle and Equipment Fueling Procedures and Practices

Vehicle and equipment fueling procedures and practices, including off-site fueling of all vehicles and equipment that regularly enter and leave a worksite, on-site designated fueling areas appropriately designed to prevent spilled fuel from entering storm drains or receiving waters, access to absorbent spill clean-up materials and proper disposal of used material, drip pans if equipment is fueled in an area other than designated fueling areas, and fuel nozzles equipped with automatic shut-off to control drips, shall be implemented to minimize or eliminate the discharge of fuel spills and leaks into storm drain systems or to watercourses at all Project facility sites. Fueling BMPs and spill response procedures shall also be described in the SWPPP. Details of these BMPs are described in Section NS-9 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1k: Implement Vehicle and Equipment Maintenance Procedures and Practices

Vehicle and equipment maintenance procedures and practices shall be performed to minimize or eliminate the discharge of pollutants from vehicle and equipment maintenance operations to storm drain system or to watercourses. Details of these BMPs are described in Section NS-10 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure SW Qual-1l: Implement Pile Driving Procedures and Practices

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of concrete, steel, or timber. Driven sheet piles are used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations shall be implemented to reduce the discharge of potential pollutants to the storm drain system or watercourses. Details of these BMPs are described in Section NS-11 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Implementation of **Mitigation Measures SW Qual-1a, SW Qual-1b, SW Qual-1c (1), SW Qual-1c (2), SW Qual-1e, SW Qual-1f, SW Qual-1g, SW Qual-1h, SW Qual-1i, SW-Qual-1j, SW-Qual-1k,** and **SW Qual-1l** would reduce the level of significance of Project impacts to surface water quality to **less than significant**.

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Figure

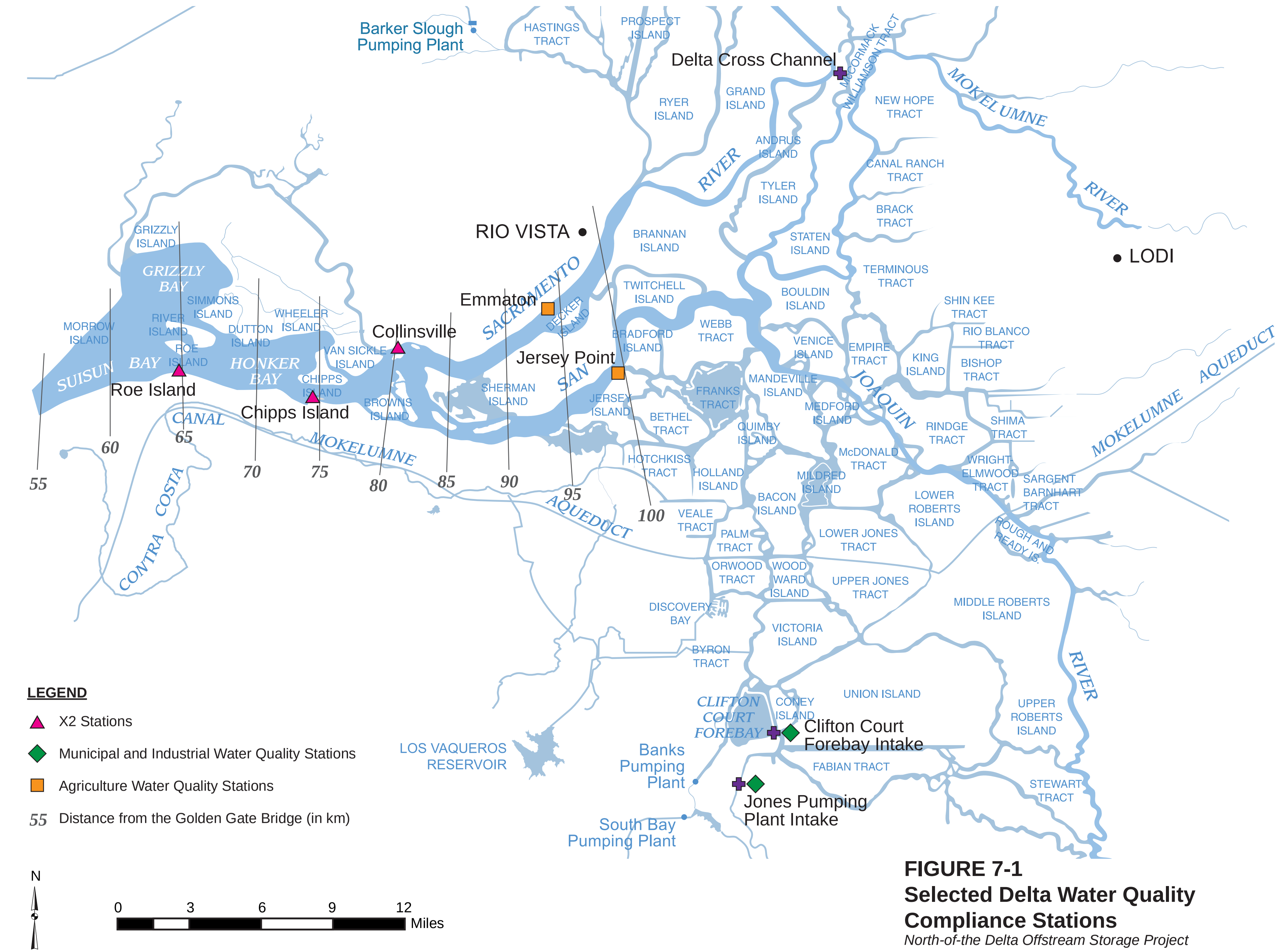

FIGURE 7-1
Selected Delta Water Quality Compliance Stations
North-of-the Delta Offstream Storage Project

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8. Fluvial Geomorphology and Riparian Habitat

8.1 Introduction

This chapter describes the fluvial geomorphological setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Fluvial geomorphology describes the origin and development of a river's shape, form, and function as a result of streamflow, sediment, underlying geology, the regional climate, river hydrology, and human-induced changes. These physical relationships affect the associated riparian habitat and wildlife that live there. The fish, wildlife, and riparian vegetation have adapted to the cycle of erosion, deposition, and changing channel pattern. The health and productivity of the fluvial system depend on the periodic rejuvenation associated with large storm events and channel movements.

The regulatory setting for geomorphology is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Sacramento River between Keswick Dam and the Pacific Ocean (a portion of the Secondary Study Area). Impacts in the remainder of the Secondary Study Area, as well as the Primary and Extended study areas, were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided in this EIR/EIS for identified significant or potentially significant impacts, where appropriate. Because none were identified for this resource, no mitigation is included in this chapter.

8.2 Environmental Setting/Affected Environment

8.2.1 Extended Study Area

The Extended Study Area includes the State and federal service areas. It includes the west side of the San Joaquin Valley, the Los Angeles Basin, and the California coast south of the San Francisco Bay Area. These three service areas have no large river systems or catchments, limited groundwater resources, generally have less precipitation than other parts of the State, and depend on water imports to meet water demands. The creeks and rivers are typically short, with little flow during summer months. Intense winter storms can cause flooding and large amounts of sediment and debris to rush down local drainages.

The Feather River watershed upstream of Lake Oroville is also part of the Extended Study Area. It is entrenched in older metamorphic and igneous rocks for the most part, except for the upper reaches where the river flows across several down-dropped fault basins filled with sedimentary deposits.

8.2.2 Secondary Study Area

The Secondary Study Area includes the Trinity, Klamath, and Sacramento rivers. The Trinity River portion extends from downstream of Lewiston Dam to its confluence with the Klamath River. The Klamath River portion includes the reach downstream of the confluence to the Pacific Ocean. The Sacramento River portion begins downstream of Keswick Dam and extends to the Pacific Ocean. It is divided into four reaches, with each reach differing substantially from the adjacent upstream and downstream reaches. These river systems and their major tributaries that comprise the Secondary Study Area are described in more detail below.

8.2.2.1 Trinity and Klamath Rivers

The Trinity River is linked to the Sacramento River by diversions from Lewiston Lake through the Clear Creek Tunnel to Whiskeytown Lake on Clear Creek. Trinity River and Clear Creek water is then diverted to Keswick Reservoir on the Sacramento River. Water from Whiskeytown Lake is also diverted through the Spring Creek Tunnel to Spring Creek and then the Sacramento River. These diversions affect streamflow in the Trinity River, in Clear Creek, and in the Sacramento River. An average of approximately 1,100 cfs of streamflow is diverted from the Trinity River basin into the Sacramento River.

The Trinity and Klamath rivers are both bedrock streams, incised into older metamorphic rocks that generally constrain the channel into narrow gorges. Riparian vegetation generally occurs in a narrow band on both banks of the river. Valley reaches also occur, such as near Weaverville and Hoopa Valley. In these areas where the narrow gorge widens, sand, gravel, and silt deposit on gravel bars to provide a wider riparian corridor.

The existing dams and diversions have affected the geomorphology primarily through the interaction with the riparian vegetation and the altered streamflow. Prior to the development of the Trinity Dam and diversions into the Sacramento River system, floodwaters would periodically remove the established riparian vegetation on stream banks and gravel bars. Large amounts of sediment would move downstream from the watershed and deposit on riffles and bars, providing new spawning habitat, and a new seed bed for vegetation. These infrequent storm events removed the older vegetation and rejuvenated the forest.

The operation of Trinity Dam has removed most of the flood peaks from the hydrograph. As a result, riparian vegetation has constricted the channel and invaded channel bars and riffles. The riparian vegetation has reduced fish habitat, significantly narrowed the channel, and isolated the gravel bars from the channel. Most of the vegetation is old, dating back to the time when Trinity Dam was being constructed. Some old vegetation is currently being removed mechanically, and high scouring flows are being released periodically. Spawning gravel is also being added periodically to riffles downstream of the dam. These flows and the added gravel should assist in returning the Trinity River to a more natural state.

Trinity Dam and Reservoir, their afterbay, and Lewiston Reservoir also affect the movement of sediment by trapping all of the bedload material and most of the suspended material. The river downstream of the dam is starved of sediment, resulting in the washing away of finer material and riffles too coarse for salmon to spawn on. Farther downstream, the removal of high flushing flows has resulted in the deposition of fine sediment from tributaries. The deposition constricts the channel and encourages riparian growth. The sand also deposits on riffles, suffocating salmon eggs and young salmon. Large woody debris is important fish habitat but is also captured by the two reservoirs, resulting in a lack of this type of habitat downstream of the dams. These effects continue to the confluence of the Trinity and the Klamath, and then to the Pacific Ocean, but decrease downstream because tributary inflow of both sediment and water reduce the influence of the dams.

8.2.2.2 Sacramento River

The Sacramento River is the largest and most important river system in California. It drains 17 percent of California’s land area, yet yields 18.4 million acre-feet, (approximately 35 percent of the water supply) annually. The river and its tributaries are the State’s most important watershed for salmon.

The Sacramento River headwaters originate on the east slope of Mt. Eddy in the vicinity of Mt. Shasta. Mt. Shasta provides much of the snowmelt that feeds the upper part of the Sacramento River during early spring months.

From Mt. Shasta, the river is cradled between the Cascade Range on the east and the Klamath Mountains on the west. The river flows into the 4.5 million acre-feet Shasta Lake, and its afterbay, Keswick Reservoir, a few miles upstream of Redding. The river then enters the Redding Basin of the Sacramento Valley, the northern half of the Great Central Valley. The river flows through the center of the approximately 150-mile-long, and 30- to 60-mile-wide, Sacramento Valley. Joining the Sacramento River are numerous smaller tributaries, including Clear, Cottonwood, Thomes, Stony, and Cache creeks on the west side, and Stillwater, Bear, Battle, Mill, Deer, Big Chico and Butte creeks on the east side. The Feather, American, Cosumnes, and Mokelumne rivers are larger tributaries draining the Sierra Nevadas on the east side of the Sacramento Valley. The Sacramento River joins the San Joaquin River in the Sacramento-San Joaquin Delta, and then empties into Suisun, then San Pablo, and finally San Francisco bays. Land elevations vary from 40 feet below sea level in the Sacramento-San Joaquin Delta region, to approximately 500 feet at the valley edge, to over 14,000 feet at Mt. Shasta. The Sacramento Valley is bordered on the east by the Sierra Nevada and Cascade ranges, and on the west by the California Coast Ranges.

The Sacramento River geomorphology from Shasta and Keswick dams to the Pacific Ocean is influenced by existing facilities causing changes in flow, temperature, sediment transport, and other factors. The four reaches of the Sacramento River are: Keswick Dam to Red Bluff, Red Bluff to Colusa, Colusa to Clarksburg, and Clarksburg to the Pacific (Figure 8-1).

Keswick Dam to Red Bluff

The Sacramento River drains approximately 6,500 square miles upstream of Shasta and Keswick dams. This includes the upper Sacramento, Pit, and McCloud rivers. An additional 2,400 square miles occur between Redding and Red Bluff, for a total drainage area of 8,900 square miles at Red Bluff.

Between Keswick Dam (at River Mile [RM] 302) and Redding (RM 298), the river flows across highly erosion-resistant Copley Formation metamorphic rocks. The river is stable, meaning that the river will remain in the current channel and retain about the same geomorphologic characteristics for the foreseeable future. The river is referred to as a bedrock stream because it flows across, and is incised into, older stable geologic formations. Boulders and cobbles are the most common bed material, because finer material has been eroded from the bed, and replacement material is being trapped by the dams. Salmon spawning gravel is being trucked in and injected into the river downstream of Keswick Dam to mitigate for this, providing some spawning gravel in the reach between Keswick and Redding.

Downstream of Redding, the river cuts through Plio-Pleistocene sedimentary deposits of the Tehama Formation, and volcanic-sedimentary deposits of the Tuscan Formation. These two formations are erosion resistant, with only minor river movement expected. The river is still considered mostly a bedrock stream. Bedrock streams are generally not affected to a large degree by changes in streamflow or sediment.

In places along this reach, the Tehama and Tuscan formations form vertical banks several hundred feet or more high. Volcanic basalts and andesites, flowing down from the Cascade Ranges to the east, show evidence of damming the river for short periods of time in the past. One such flow occurs at Table Mountain near Jellys Ferry, and another at Paynes Creek.

Bright red gravelly deposits of the Pleistocene Red Bluff Formation are exposed on top of the older Tehama-Tuscan formations. The sources of these gravels were glacial streams from the surrounding mountains to the east, west, and north.

Terrace deposits occur in places. These are typically flat benches inset into the older deposits. Four terrace levels are generally present, with the older terraces being higher than the younger terraces.

A few places in this reach are mostly alluvium, resulting in erodible unstable banks. In these places, the river may move its channel several thousand feet before encountering more resistant deposits.

For the most part, the river is stable, with only minor bank erosion occurring in alluvial reaches. The river is entrenched, having cut down through hundreds of feet of older rocks and deposits. Iron Canyon, north of the City of Red Bluff, is a dramatic example. Several large bends occur in the lower section of this reach, with one near Jellys Ferry and another in the Bend area.

Three larger and several smaller tributaries join the Sacramento River in this reach. Clear Creek drains the metamorphic and igneous rocks west of Redding. Whiskeytown Dam controls the flows in Clear Creek, and also receives Trinity River water. The creek downstream of the dam is entrenched in a canyon consisting of erosion-resistant metamorphic rocks. The downstream end of the creek is underlain by Tehama Formation and is flanked by terrace deposits. Extensive terrace deposits on the north side of the creek were dredged for gold, leaving dredger tailings that are subsequently being mined for sand and gravel. Gravel mining was also done in the channel, and coupled with the capture of bedload by the reservoir, have resulted in channel incision and loss of salmon spawning riffles. Several gravel bars and riffles have been re-constructed to mitigate for this loss. Gravel injection has also been done by placing spawning gravel along banks, and allowing the deposit to erode during high flows.

Cottonwood Creek also drains the west side of the valley, but the underlying rocks are mostly sedimentary shale, siltstone, sandstone, and conglomerate of the Great Valley Sequence. Upstream, the North Fork, Middle Fork, and South Fork originate in the Klamath Mountains and Coast Ranges. The lower ten miles of the creek is alluvial, with sediment deposition, bank erosion, and meandering creating a broad riparian corridor.

The construction of Shasta, Keswick, and Whiskeytown dams in the watershed has resulted in the capturing of bedload sediment that would normally supply the downstream reaches. The dams capture all the bedload moving in from the upstream watershed, and release clear water. The tributaries in the upper part of this reach are too small to provide sufficient bedload sediment. Cottonwood Creek is the first creek to provide a substantial amount of sediment.

Battle Creek drains the volcanic rocks of the Cascade Range on the valley's east side. Battle Creek does not produce much sediment, but cool clear springs in the upper part of the watershed provide a year-round flow. Hydroelectric project dams and diversions occur, blocking upstream migration of salmonids, but some of these are planned for removal. The Battle Creek Fish Hatchery, built to mitigate for Shasta Dam, can attract tens of thousands of returning Chinook salmon and steelhead into Battle Creek each year.

The Sacramento River in this reach has a boulder, cobble, and gravel bed for the most part. The channel upstream of the confluence with Cottonwood Creek has mostly an armored stream bed, a condition where finer particles have been eroded, leaving a much coarser surface deposit. Most of the salmon spawning riffles between Redding and the Cottonwood Creek confluence are too coarse for the salmon to spawn in, despite efforts to mitigate for this with salmon spawning gravel injections.

Red Bluff to Colusa

The riparian corridor between Red Bluff and Colusa is one of the richest and most diverse wildlife habitats remaining in California. The river reach from Red Bluff to Colusa is substantially different from the Keswick Dam to Red Bluff reach. At Red Bluff (RM 243), the Sacramento River exits from the canyon and flows onto the broad alluvial plains of the Sacramento Valley. At that location, the river flows across its own deposits of sand, silt, and gravel. Both the bed and the banks consist of erodible alluvium resulting in a river whose form and function vary greatly with changes in streamflow, sediment, underlying geology, bank composition, climate, and human activities. The watershed increases in size by 3,190 square miles, for a total watershed area of 12,090 square miles at Colusa (RM 144).

In this reach, bank erosion is a normal, natural, and essential element of the landscape. The fish, wildlife, and riparian vegetation have adapted to the cycle of erosion, deposition, and changing channel pattern in which the river meanders slowly back and forth across a broad meander belt. The health and productivity of the system at any one point depends on the periodic rejuvenation associated with these channel movements.

Streamflow is a major determinant of the amount of erosion that occurs. Therefore, this more erodible reach of the river will be affected by dams and diversions that reduce streamflow.

In meandering river systems, erosion is generally associated with the outside (concave side) of the bends (Figure 8-2). Point bars form on the inside (convex side) of channel bends where lower flow velocities cause sediment to deposit. The combination of erosion of outside bends and deposition on point-bars results in channel migration. Over the long term, the river width and profile does not significantly change because erosion and deposition are generally in balance.

Over time, this process of erosion and deposition creates a broad alluvial floodplain. Channel movement is often incremental and the bends in the river gradually move downstream. The channel will move back and forth, re-working much of the same area. This area is referred to as a meander belt. On each side of the meander belt, there are older deposits that are generally more erosion resistant. These older deposits are generally referred to as geologic control in that they tend to constrain the meander belt.

Erosion rates and meander rates vary widely, depending on a number of different variables. Bank composition is a major factor, with the more clay-rich banks and gravelly banks less erodible, and the sandy banks being more erodible. In some places, the river impinges on geologic control at the edge of the meander belt, reducing the erosion rate.

Stream discharge is another factor. Changes in flow resulting from Shasta, Keswick, Whiskeytown, and Black Butte reservoirs have affected bank erosion rates to some degree. By comparing pre-Shasta to post Shasta meander lines, estimates of bank erosion can be calculated. The pre-Shasta 1896 to 1946 bank erosion rate, as calculated by the U.S. Army Corps of Engineers (USACE), is 1.94 acres per mile per year (16 feet per year) between Red Bluff and Colusa (USGS, 1977). The rate between Chico Landing and Colusa was significantly lower after Shasta Dam was constructed (USGS, 1977). The bank erosion rate was 14 feet per year between Red Bluff and Ord Ferry for the period 1977 to 1987. The calculated post-Shasta rate was 16.2 feet per year from 1976 to 1997 for the Red Bluff to Colusa reach, but this short time includes the 1997 flood event, which skews the data (DWR, 2010). Note that the calculated rates depend to a large degree on the period selected and the inclusion of major storm events.

Bank curvature is also a major factor controlling meandering. Generally, the erosion rate is higher, the more that a river curves. However, with higher curvature, there is an increasing tendency for chute cutoffs to occur. Chute cutoffs create a new channel across the bend, straightening the channel. This can occur in a single high flow event. The old channel may fill with sediment or may form an oxbow lake (formed when bends are cut off) separated from the new channel.

The Red Bluff to Colusa reach may be divided into a number of sub-reaches based on fluvial geomorphology. In general, short straight reaches with lower gradient are separated by longer more winding, or sinuous reaches with higher gradient. The sinuosity of a river channel refers to the tightness of its meander loops. A straight reach has a low sinuosity, while a curved reach has a higher sinuosity. The straight reaches generally have some geologic control providing bank stability. Meander migration in the short straight reaches tend to be at a rate of a few hundred feet per 100 years, while in the longer more sinuous reaches, the rate can be as high as 5,000 feet per 100 years.

Bank protection has been installed along the outside of river bends in many places to protect existing land uses, including agriculture, as well as buildings, pumping plants, bridges, and levees. This bank protection stops bank erosion locally, and reduces the average reach-length erosion rate.

These “hard points” will change the rate and pattern of channel movement both upstream and downstream. For example, if the downstream bank of a bend is protected, and the upper bank is left unprotected, then upper bank migration will cause the bend to collapse and be cut off. In other places, bank protection can actually increase bank erosion and meandering, generally by concentrating flows toward an erodible bank downstream, or by inducing a channel bend cutoff. There are also many locations where bank protection was not maintained and the river eventually either eroded around or through the bank protection.

Levees have also been constructed along the river, mostly in the lower half of the reach downstream of Chico Landing near Hamilton City. Levees affect both the river channel and the floodplain. Levees affect the channel by concentrating the flow, increasing velocities and sediment transport. Leveed river sections tend to become deeper, particularly where the levees are close together, because flow velocities are concentrated in one place. Levees generally prevent overbank flow and the deposition of fine sediment over the floodplain. This can cause problems farther downstream when the sediment deposits in weirs, floodways, and bypasses. Levees in these areas are typically set back to the edge of the meander belt and generally founded on geologic control. In most places, at least part of the Sacramento River floodplain is between the levees.

Flood relief structures were built along with the levees to control the amount of flow in the leveed section of the river. Excess flow spills over into the Butte Basin at three of these weirs: the M&T, 3Bs, and Goose Lake flood relief structures. These structures are located at natural depressions in private levees between Chico Landing and Colusa.

Between Chico Landing and Colusa, broad natural levees and wide overflow basins have developed on both sides of the river. Manmade levees have been built on the crest of the natural levees in many places. The Colusa basin drain is on the west side of the river, and the Butte basin on the east. The basins serve as natural flood overflow areas during the winter and as agricultural drains during the irrigation season. The Colusa, Sutter, and Yolo bypasses are broad marshy areas underlain by clayey soils rich in organic deposits. The bypasses convey floodwaters safely out of the basin and into the Sacramento-San Joaquin Delta. They may be flooded for months at a time, but a large percentage of this land is being farmed during the summer.

Agriculture primarily affects the river by the removal of floodplain vegetation. The vegetation acts as a filter, causing the finer sediment to deposit. Vegetation removal on meander bends increases floodflow velocities and increases the likelihood that a chute cutoff will occur. These cutoffs are new channels that straighten the river and may reduce the available habitat. Land leveling along the banks of the river generally removes soil from the upstream end and moves it to the downstream end, a process that lowers the upstream bank, thereby increasing the incidence of flooding.

Meander migration rates are important to the species that depend on the habitat variability, riparian forest continuity, and transient features such as oxbow lakes, islands, and point bars. The meandering process creates a wide corridor with a variety of riparian forest ages and stages. Habitat complexity is high, a result of the different soil types, depths to groundwater, and wetland areas.

There is a wide variety of riparian forest species that develop in the meander belt, resulting partially from the different soil types. The clay-rich soils that developed on old oxbow lake deposits support many species. Because of the richness and water-holding capacity, the trees on these soils grow much taller than the surrounding forests. Willow scrub forests develop on the water-side edge of a point bar. Cottonwoods also germinate here, and the survivors develop deeper root systems as deposition continues and the river migrates farther away. Other species include sycamore, alder, box elder, black walnut, Oregon grape, and poison oak.

Over time, the river migrates away, the soils become deeper, and the depth to the groundwater table increases to a point where it becomes too far down for the riparian species to survive. Gradually, valley oak and live oak replace the cottonwoods. Savannahs and seasonal grasslands exist until the river returns to begin the process anew.

Bank swallows depend on bank erosion to create new vertical bank habitat, clean of parasites, and protected from predators. Riparian tree species depend on deposition on the inside of bends to create new seed beds close to the groundwater table. Birds depend on habitat variability caused by bend migration to provide nesting, feeding, and breeding habitats. Fish depend on shade and insect food from streamside riparian vegetation, on large woody debris and tree roots washed into the river for cover, and on fresh gravel washed from eroding banks for spawning.

Bank erosion and meandering also creates complexity in the river channel. Multiple channels, islands, point bars, and pools are formed as a result of the meandering process. Mature trees on the eroding bank are undercut and fall into the river. This large woody debris provides insect food, cover, shade, and holding areas for feeding fish. The large woody debris also creates hydraulic diversity, creating a more complex channel bottom.

Fall-run Chinook salmon spawn in this reach, particularly later in the spawning season when temperatures drop. The spawning gravel is generally appropriately sized and clean—a result of the active meandering which re-works the gravel deposits. Bank erosion supplies new fresh gravel on a yearly basis to the riffle surface. Green sturgeon also use this area.

There are existing diversions in this reach, the larger of which are the T-C Canal at Red Bluff, the GCID Canal upstream of Hamilton City, the M&T Ranch pumps downstream of Hamilton City, the Provident-Princeton-Codora-Glenn pumps downstream of Ord Ferry, the Reclamation District 1004 pumps in Princeton, and the Maxwell Irrigation District pumps downstream of Princeton. The T-C Canal and the GCID Canal are potential sources of water for the Project.

The RBDD, at the upstream end of this reach, historically diverted both water and sediment into the T-C Canal at RM 243. The RBDD will cease operation in September 2011, and will be replaced by the Red Bluff Pumping Plant's turbine pumps and a new set of fish screens. The Red Bluff Pumping Plant is the first of the three diversion points proposed for the Project. The gaging station that best defines hydraulic conditions in this reach of the river is located above Bend Bridge, about ten miles north of Red Bluff

The existing GCID Canal diversion is located approximately five miles upstream of Hamilton City at RM 206. Bank erosion and meander rates have traditionally been high in this area. However, bank protection at the upstream Snaden Island, geologic control exposed on the west bank directly upstream, and a grade control structure (with riprap on both banks) decrease bank erosion susceptibility. Sediment is also diverted at this location. Suspended sediment deposits in the GCID Canal facilities, and bedload depositing in the meander loop is removed periodically. The stream gage that best defines the hydraulic conditions in this reach is at Hamilton City.

Beginning downstream of Hamilton City is a series of flood relief structures, weirs, and bypasses that move excess flood flows out of the Sacramento River and into the adjacent basins. There are three weirs (flood relief structures with a controlled elevation) adjusting the flow remaining in the river: Moulton, Colusa, and Tisdale (Figures 9-2A and 9-2B in Chapter 9 Flood Control and Management). Moulton and Colusa weirs are located a few miles upstream of Colusa. These weirs divert all but 45,000 cfs of flood flows into the Colusa Bypass. The Colusa Bypass then moves the overflow into the Butte Basin, the Sutter Bypass, the Yolo Bypass, and the Sacramento-San Joaquin Delta. The stream gages that best define the hydraulic conditions in this reach are at Butte City and Colusa.

The flood structures are part of the Sacramento River Flood Control Project, authorized by Congress in 1917 and built by USACE. Downstream, Tisdale Weir moves flood water into the Sutter Bypass and then into the Yolo Bypass. Most of the bypass areas are farmed during the agricultural season. However, during floods, much of the weir and bypass areas become spawning and rearing habitat for splittail, and rearing areas for salmonids and other fish species. Some riparian vegetation, sloughs, and wetlands occur in the bypasses, providing habitat for numerous species.

Colusa to Clarksburg

The Sacramento River at Colusa (RM 144) has a watershed area of 12,090 square miles. At the City of Sacramento, the watershed area has increased substantially to 23,502 square miles, the result of the addition of the drainages of the Feather, Yuba, Bear, and American rivers.

Downstream of Colusa to the Sacramento-San Joaquin Delta (beginning at Clarksburg), the river is completely different from the two reaches upstream. Levees built to contain the flow line both banks. The channel capacity is low, approximately 45,000 cfs, with most of the floodwaters diverted out of the channel at Moulton Weir, Colusa Bypass, and Tisdale Weir into the Sutter Bypass. The gradient is also low, and the banks contain cohesive clay, resulting in little erosion and meandering. Riprap has been installed in many areas to protect the banks and levees. The river has also been straightened for navigation in places by cutting a new channel across a bend.

Riparian habitat is generally sparse, with some vegetation along banks. However, in many places, the bank protection is being maintained by the removal of vegetation. Most of the surrounding land has been converted to farms and urban areas, with only a few isolated remnants of riparian forests and oxbow lakes. Riparian habitat is patchy and does not have the complexity and variety typical of the Red Bluff to Colusa reach.

The river channel is also uniform, a single channel with no islands, point bars, or riffles. The bed consists mostly of sand with some gravel. There is very little sediment transport, evidenced by the presence of only a few sand bars. Flood flows are diverted into the bypasses, where most of the fine sediment is deposited.

The river is a migration corridor for Chinook salmon, steelhead, and green and white sturgeon to spawn in the upper two reaches and for fry heading for the Pacific Ocean. The temperatures are too high, and the gravel too small for salmon spawning downstream of Hamilton City. Numerous warm water species live in this area or migrate through it, including the introduced striped bass and American shad.

Numerous irrigation diversions exist, from small turbine pumps set on the bank, to large reclamation district or municipal pumping plants placed directly on the river.

The Feather River joins the Sacramento River near Verona. The Feather River drainage also includes the Yuba and Bear rivers, for a total watershed area of nearly 6,000 square miles. Hydraulic gold mining in the late 1800s was responsible for huge amounts of sediment being introduced into the lower Feather River. Since then, the channel has been cutting down through these deposits, seeking its pre-mining elevation. The lower ten miles of the Feather River still has abundant and large sand bars slowly moving down the river. Lake Oroville on the Feather River, Englebright Reservoir on the Yuba River, and New Camp Far West Reservoir on the Bear River, impound and control flows and sediment in their respective watersheds. To a lesser extent, the afterbay of the Thermalito Complex, located downstream of Lake Oroville, also affects Feather River flows.

Downstream of the Feather River, the Sacramento River widens substantially. Enormous amounts of fine sediment poured out of the Feather River drainage during the latter part of the 1800s, the result of hydraulic mining for gold. Wood piles were installed in the Sacramento River on both banks in an attempt to concentrate the flow in the center of the channel and keep it free of sand bars. Remnants of these structures are still visible. Dredging to remove sediment was done on a periodic basis during the 1900s to keep the channel open for navigation.

The American River, with an additional 2,000 square miles of watershed, joins the Sacramento River at Sacramento. Hydraulic mining also occurred in this watershed, but the mining activity was not nearly as extensive as on the Feather River. Folsom Reservoir, and its afterbay Lake Natoma, control the flows in this river. The two reservoirs also stop the movement of bedload into the downstream reach of the river, which has resulted in some of the riffles becoming gravel starved with a surface layer containing substrates too coarse for salmon spawning.

Most of the length of the American River from Lake Natoma to its mouth in Sacramento is leveed on both sides of the river. Rock riprap and more biologically friendly forms of bank protection have been installed to protect the levees. Only minimal bank erosion and few channel changes occur.

In some places, tall compacted clay-silt banks of the Laguna Formation (correlated to the Tehama Formation) provide protection from erosion. Tailings, remaining from floating gold dredges, occur in places. Clayey gravels of the Victor Formation (correlated to the Red Bluff Formation) cap some of the ridges.

Clarksburg to the Pacific Ocean

The total watershed area of the Sacramento River, where it joins the San Joaquin River near Collinsville, is 26,332 square miles.

The Sacramento-San Joaquin Delta is a low lying region of the Great Central Valley formed by the confluence of two great river systems, the Sacramento and San Joaquin rivers. The Delta region consists of several islands surrounded by channels. Most of the islands are surrounded by levees protected with rock riprap. Subsidence, caused by farming, wind erosion, and oxidation and burning of peat, has been a problem on many of the islands, with elevations now as low as 40 feet below sea level.

The upstream end of the Delta region begins near the town of Clarksburg (RM 42). Sloughs include Elk, Sutter, Georgiana, Steamboat, Snodgrass, and many others. The sloughs, and the Sacramento River upstream to Sacramento, are affected by tidal influences and salt water intrusion. These sloughs and the river have a surface elevation higher than the interiors of most of the islands. The current geomorphology depends on the levees constructed to prevent flooding. If a levee breaks, an island would be flooded to depths of several tens of feet.

Most of the Delta channels are sand bedded. Velocities tend to be low, even during major floods. During most of the year, tidal flows predominate. Bank erosion is minimal. Most of the levees are protected by rock riprap. Boat wakes and wind-driven waves are the largest causes of bank erosion.

Streamflow in the Delta channels is maintained artificially high during the summer months by releasing additional water from reservoirs. This is done to flush pollutants, reduce salt water intrusion, increase water quality, and to provide fresh water to irrigation pumps and municipal uses in the western part of the Delta.

8.2.3 Primary Study Area

The only location along the Sacramento River within the Primary Study Area where Project construction, operation, and maintenance activities would occur is at the proposed Delevan Pipeline Intake and Discharge Facilities location, on the west side of the Sacramento River at RM 158.5. This location is within the Red Bluff to Colusa Reach of the Sacramento River, approximately five miles south of the Town of Princeton and immediately downstream of the Maxwell Irrigation District pumps.

The Sacramento River, at RM 158.5, is located on erosion resistant deposits (referred to as geologic control) of the Modesto Formation. The Tehama Formation, an older erosion resistant unit, underlies the Modesto Formation at a depth of a few tens of feet. Although the river is currently near the edge of geologic control, it has historically moved back and forth over a thousand feet or more within its narrow meander belt. The river's meander belt at this location is narrow compared to the upstream and downstream areas. Levees occur on both banks, with the levees 2,000 to 2,500 feet apart. Upstream and downstream, the levees are farther apart; in some locations, more than one mile apart. Bank protection occurs along the east bank in the bend directly upstream.

Bank erosion and deposition are active processes in this area. Figure 8-3 shows the Sacramento River channel meander locations since 1896. A meander is a bend that is moving because of bank erosion. As the bend moves sideways and downstream, the location of deposition also moves downstream. It is expected that the channel will move away from its current location over a period of time.

A point bar that is located on the west bank upstream of the proposed intake facility location has been quite active, moving generally south toward the diversion point. As of 2012, the point bar is located approximately 1,400 feet north of the proposed intake facility location. A second point bar is located directly across the river on the east bank.

The upstream point bar moved downstream approximately 400 feet between 1958 and 1976, or the equivalent of 22 feet per year. In 1981, USACE installed bank protection along the bank across from the point bar, and then extended the bank protection both upstream and downstream in 1987. Between 1976 and 1990, the point bar moved an additional 150 feet, but has not moved in the last 22 years since then. This is a typical point bar reaction to the placement of bank protection, and it is expected that the point bar will not move in the future if the bank protection continues to function.

The downstream point bar, across from the diversion point on the east bank, also moved downstream for a distance of approximately 1,000 feet between 1958 and 1990, or the equivalent of 31 feet per year. During this time, the river was meandering westward at the same rate as the point bar. Around 1990, the river encountered geologic control (older and more erosion resistant geologic deposits) along the west bank, essentially stopping the migration. Since then, the point bar has not moved.

Sediment movement in the Sacramento River may be high in this location. Suspended sediment levels, consisting mostly of silt and sand, are high during large discharges. High suspended sediment levels are mostly a result of bank erosion occurring upstream, although tributary inflow is also a factor.

River banks in this area generally consist of an upper layer of silt and sand that averages approximately 10 feet thick, and a lower layer of sand and gravel that averages approximately 16 feet thick. When eroded, the upper layer becomes mostly suspended sediment, and the lower layer becomes mostly bedload (sand and gravel). The bedload moves by bouncing along the bottom until it reaches an area with lower velocities, which is generally the next point bar or island downstream. Figure 8-4 shows an abundance of gravel bars and mid-channel islands, suggesting that bedload sediment is abundant in this area.

Moulton Weir is located across and on the opposite side of the river from RM 158.5. This overflow weir, which is part of the Sacramento River Flood Control Project, spills excess water into the Butte Basin during floods. Moulton Weir may affect the movement of bedload sediment. The weir removes water and suspended sediment from the river during high flow events. However, bedload sediment moves along the bottom and does not transport into the weir. The reduced flows in the Sacramento River downstream of the weir have less stream power to move the sediment transported in from upstream, resulting in deposition in this general area.

8.3 Environmental Impacts/Environmental Consequences

8.3.1 Regulatory Setting

The Sacramento River's natural resources that comprise the geomorphology are regulated at the federal and State levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

8.3.1.1 Federal Plans, Policies, and Regulations

- Coordinated Operations Agreement
- 2009 National Marine Fisheries Service Biological Opinion
- Federal Endangered Species Act
- U.S. Fish and Wildlife Service Operations Criteria and Plan Biological Opinion

8.3.1.2 State Plans, Policies, and Regulations

- Senate Bill 1086
- California Endangered Species Act (CESA) of 1982

8.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* does not include criteria that are specific to fluvial geomorphology. The evaluation criteria used for this impact analysis were based on professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Substantial alteration of natural river processes and characteristics such as bank erosion, sinuosity, gradient, flow velocity, sediment transport, bed coarseness, depth, and width.
- Substantial alteration of natural river meandering, bank erosion, and deposition, with consequent substantial alteration of riparian vegetation regeneration and habitat complexity.
- Substantial alteration of the amount of large woody debris, boulders, shaded riverine aquatic habitat, or spawning gravel in rivers, resulting in substantial loss of fish rearing, holding, spawning, and feeding habitat.

Significance of the impacts on the above-listed geomorphologic parameters was determined by comparing the results from computer models that modeled different scenarios of the proposed operation of the alternatives, checking the parameters for changes that are larger than normal and natural variations over a long study period. The modeled changes that were predictable, consistent, and larger than the observable natural variations in the above-listed parameters would be considered to be significant impacts.

8.3.3 Impact Assessment Assumptions and Methodology

8.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to river geomorphology:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.

- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.

8.3.3.2 Methodology

For this analysis, the Sedimentation and River Hydraulics Group of the U.S. Bureau of Reclamation conducted computer river hydraulic, sediment, and meander modeling that compared the effects of the four alternatives on natural river processes and characteristics. The USRDOM hydraulic model simulated 82 years of Sacramento River flow (from 1921 to 2003) for each of the alternatives.

Sediment transport models, in conjunction with the USRDOM model, were used to predict sediment transport and changes in bed coarseness, depth, and width. Two sediment transport models were used: one to predict variations in bedload movement, and one for suspended sediment movement.

The USRDOM model simulates daily river flows in the Sacramento River based on the operations specified by the CALSIM II model for each alternative. The monthly CALSIM II results are used to simulate daily reservoir operations and river flows over the period of simulation extending from water year 1922 through 2003 (82-year simulation period). The USRDOM model description and results are included in Appendix 6C. Detailed discussion of the CALSIM II model is provided in Appendix 6B.

The bedload analysis (Appendix 8A) investigated the sediment transport capacity of the Sacramento River from Keswick to Colusa Weir. The river was divided into 15 reaches based on geomorphology and hydrology. The USRDOM model daily flows were used to develop flow duration curves. Bedload transport was calculated using several available equations, with one selected that best described the available observational data. The transport of material greater in size than 2 millimeters was calculated in tons per year for each reach. Using this approach, the aggrading and degrading reaches could be identified, as well as changes in streambed composition predicted over the 82-year simulation period.

The suspended sediment transport model (Appendix 8A) investigated the movement of sediment in the Sacramento River and estimated the amount of sediment that would be diverted at the proposed Project diversions for each alternative. The USRDOM model simulated daily flows were used in conjunction with actual U.S. Geological Survey gaging station sediment sampling results to develop a flow versus suspended sediment rating curve. The rating curve was then used to calculate the sediment transport in the Sacramento River and the amount of sediment entrained in the diversion for each alternative.

The effects on natural river meandering, bank erosion, and deposition in the Sacramento River channel between Red Bluff and Colusa, with consequent effects on riparian vegetation, was modeled using the SRH-Meander model (Appendix 8A). Inputs to the model included USRDOM model daily flows, streambank erodibility, and channel hydraulic characteristics.

The SRH-Meander model simulated the bed topography, flow field, and bank erosion rate in a curved channel with an erodible bank and bed. At the end of each time step, it computed the amount of bank erosion and updated the channel centerline alignment. The amount of bank erosion was calculated using the near-bank depth-averaged flow velocity and a method that incorporated a multiple-size sediment transport equation (Appendix 8A). The model was run with all of the existing riprap in place. The model was calibrated by running the model between 1976 and 1999 using existing conditions and comparing the actual channel changes with the results of modeling. The model was tuned by adjusting the bank erodibility factors until a best-fit between actual and calculated meandering occurred.

The calibrated SRH-Meander model was run using the USRDOM daily flows from 1980 to 2010 to predict channel meandering from 2010 to 2030. The outputs of the model were a series of maps showing the channel centerline alignment in 2030 for each of the alternatives and graphs showing the accumulated migration distance.

Further, in assessing the impacts to the riparian vegetation along the Sacramento River in the Secondary Study Area, modeling specific to riparian vegetation, including results from the SRH-1DV and SacEFT models, were used. The SacEFT results were also used to analyze impacts to the large woody debris recruitment on the Sacramento River.

The SRH-1DV model simulates the establishment, growth, and mortality of vegetation, in addition to computing hydraulics and groundwater surface in the riparian zone near the river. The simulation tracks daily vegetation changes through 82 years of simulated flow, within the 107 river miles of Sacramento River from upstream of Red Bluff to Colusa. The SRH-1DV analysis focuses on four key valley foothill riparian vegetation types that are representative of the range of riparian communities of the Sacramento River: cottonwood, mixed forest, Gooding’s black willow, and narrow leaf willow. The detailed description of the SRH-1DV model and the associated alternatives evaluation is provided in Appendix 8A.

The SacEFT decision support tool provides key performance measures for various focal aquatic and terrestrial species, and riparian habitat in the Sacramento River. It specifically includes performance measures for evaluating the effects of various flow scenarios on the initiation success and post-initiation scour risk of the Fremont Cottonwood seedlings, and the amount of large woody debris recruited to the mainstem Sacramento River. These performance measures are used as a general indicator for assessing the impacts on riparian vegetation and potential habitat quality in the mainstem Sacramento River in Secondary Study Area. The detailed description of the SacEFT model and the associated alternatives evaluation is provided in Appendix 8B.

8.3.4 Topics Eliminated from Further Analytical Consideration

Because reservoir level fluctuations at San Luis Reservoir would have no effect on geomorphologic processes, only the operational impacts associated with water supply reliability are discussed in the impacts analysis for the Extended Study Area.

Because the existing Red Bluff Pumping Plant and GCID intakes would be the only locations along the Sacramento River where Project construction and/or operation and maintenance activities would occur (and where potential impacts to/from geomorphologic processes as a result of those activities may occur), the remainder of the Secondary Study Area is not discussed.

Because the only location along the Sacramento River where Project construction, operation, and maintenance activities would occur (and where potential impacts to/from geomorphologic processes as a result of those activities may occur) would be at the proposed Delevan Pipeline Intake/Discharge facilities location, potential impacts related to geomorphology are not discussed for the remaining Primary Study Area Project facilities. Similarly, because the proposed Delevan Pipeline Intake/Discharge facilities would not be constructed with implementation of the No Project/No Action Alternative, the Primary Study Area is not discussed for that Alternative.

8.3.5 Impacts Associated with the No Project/No Action Alternative

8.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to geomorphological processes has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on natural river processes and characteristics, when compared to Existing Conditions.

Most geomorphologic changes occur as a result of flood flows. Modeling of water supply reliability for the Extended Study Area indicates that changes in flow resulting from changes in water deliveries would be generally small and would occur during summer months when flows are too low to cause significant hydraulic changes. Therefore, **there would not be a substantial adverse effect** on geomorphological processes, when compared to Existing Conditions.

Modeling of water supply reliability for the Extended Study Area indicates that changes in flow resulting from changes in water deliveries would be generally small and would occur during summer months when flows are too low to cause significant hydraulic changes. Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Changes in water deliveries could occur in response to population growth. However, most geomorphologic changes occur as a result of flood flows, and changes in water deliveries would not be expected to result in flood flows. Therefore, **there would not be a substantial adverse effect** on geomorphological processes, when compared to Existing Conditions.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Refer to the **Impact Geom-1** discussion. That discussion is also applicable to alterations to the river, erosion and deposition, and riparian vegetation and habitat complexity.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

Refer to the **Impact Geom-1** discussion. That discussion is also applicable to effects on fish habitat from alterations to the amount of large woody debris, boulders, shaded riverine aquatic habitat, or spawning gravel.

8.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and

Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

Impacts to the geomorphology of the Klamath, Trinity, and Sacramento River tributaries; the San Joaquin river system; and other elements of the Secondary Study Area depend on the degree of hydraulic alteration associated with the No Project/No Action Alternative. These hydraulic changes and consequent geomorphologic changes as a result of the projects included in the No Project/No Action Alternative would be evaluated pursuant to CEQA and/or NEPA during individual project environmental review, and mitigation would be required for significant geomorphologic impacts during those reviews.

Most of the geomorphologic impacts of this alternative would occur in the Sacramento River between Keswick Dam and the Pacific Ocean, as explained below. Reclamation's computer modeling for the Sacramento River showed minor changes in river flow and flow duration (Appendix 8A).

Modeling results indicate that the Sacramento River annual flow volumes would be comparable between Existing Conditions and the No Project/No Action Alternative (Appendix 8A). There would be a slight decrease in annual flow upstream of the Red Bluff Pumping Plant and a slight increase in flow downstream of the Red Bluff Pumping Plant with the No Project/ No Action Alternative. However, high flows are more geomorphologically significant than lower flows. The changes in high flow events would also be minor and have a low exceedance probability (Appendix 8A).

Modeling results indicate that suspended sediment would continue to be entrained at the Red Bluff Pumping Plant and GCID Canal Intake if the No Project/No Action Alternative were implemented. The existing suspended sediment entrainment rate at the Red Bluff Pumping Plant is estimated to be approximately 4,000 tons[1] per year. Modeling results indicate that this rate would not change if the No Project/No Action Alternative is implemented (Appendix 8A).

Therefore, the amount of suspended sediment that would be entrained at the Red Bluff Pumping Plant with implementation of the No Project/No Action Alternative **would not have substantial adverse effect**, when compared to Existing Conditions**.**

The estimated average amount of suspended sediment currently moving in the river past the Hamilton City stream gage is approximately 3.92 million tons (USACE, 1983).The existing GCID Canal Intake sediment entrainment rate is estimated to be 44,000 tons, representing 1.1 percent of the amount of suspended sediment in the Sacramento River at that location. Modeling results indicate that the amount of suspended sediment that would be entrained at the existing GCID Canal Intake as a result of implementing the No Project/No Action Alternative would be 47,000 tons, representing 1.2 percent of the amount of suspended sediment in the Sacramento River at that location. The slight increase in the amount of sediment diverted, when comparing Existing Conditions to the No Project/No Action Alternative, is less than one-tenth of one percent and is well within natural annual variation. Therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on Sacramento River geomorphology, when compared to Existing Conditions.

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[1] In general, 1.5 tons of sediment is equal to one cubic yard.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Modeling results indicate that impacts to meandering between Existing Conditions and the No Project/No Action Alternative would be minor (Appendix 8A), which **would not result in a substantial adverse effect**.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

The effects on the amount of instream woody material, boulders, shaded riverine aquatic habitat, and spawning gravel are primarily functions of bank erosion. Bank erosion undercuts the banks, and trees fall in the water. The banks are composed of silt, sand, and gravel. The gravel deposits on riffles to form spawning habitat. Because there would be no significant difference in bank erosion between Existing Conditions and the No Project/No Action Alternative, **there would be no substantial adverse effect**.

8.3.6 Impacts Associated with Alternative A

8.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, and Wildlife Refuge Water Use

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

When compared to Existing Conditions and/or the No Project/No Action Alternative, the amount of alteration to natural river processes and characteristics within the Extended Study Area associated with implementation of Alternative A would be minor. Most geomorphologic changes occur during flood flows. Reservoir releases may increase or decrease as a result of Alternative A operations for water deliveries, but the hydraulic changes would not increase or significantly change flood flows. Therefore, geomorphologic impacts are expected to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Refer to the **Impact Geom-1** discussion. That discussion is also applicable to alterations to the river, erosion and deposition, and riparian vegetation and habitat complexity.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

Refer to the **Impact Geom-1** discussion. That discussion is also applicable to effects on fish habitat from alterations to the amount of large woody debris, boulders, shaded riverine aquatic habitat, or spawning gravel.

8.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

The Sacramento River from Keswick Dam to the Pacific Ocean is considered to be the main area where Project-related fluvial geomorphology impacts could occur[2]. Compared to Existing Conditions and/or the No Project/No Action Alternative, implementation of Alternative A would result in the Sacramento River experiencing the largest changes in flow and sediment due to hydraulic changes.

The remainder of the Secondary Study Area, including Trinity Lake, Lewiston Lake, Trinity River, the Klamath River, Whiskeytown Lake, Spring Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Folsom Lake, Lake Natomas, or the American River would experience only minor changes in peak flow, and would, therefore, not be expected to substantially alter natural river processes. More noticeable flow changes would occur during the summer, but low summer flows do not substantially alter natural river processes. Also, no Project construction or maintenance activities would occur at any of the above-listed locations. Operational changes resulting in alteration of streamflow would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative, because it would not significantly affect fluvial geomorphology in these areas.

Construction activities associated with the addition of a pump at the Red Bluff Pumping Plant would not occur within the Sacramento River and would not require changes in pumping plant operations. Sediment removal at the Red Bluff Pumping Plant and GCID Canal Intake would occur during the regularly scheduled maintenance period for these intakes and would require the same maintenance activities conducted for Existing Conditions. Therefore, construction activities at the Red Bluff Pumping Plant, and maintenance activities at the Red Bluff Pumping Plant and GCID Canal Intake, are expected to be **less than significant** to Sacramento River geomorphology, when compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of Alternative A would result in alterations to natural river processes and characteristics, such as bank erosion, sinuosity, gradient, flow velocity, sediment transport, bed coarseness, depth, and width by changing the timing, distribution, and amount of flow in the Sacramento River between Shasta Dam and the Pacific Ocean. There would be operational impacts to the Sacramento River downstream of Keswick Dam, and extending into overflow areas, such as the Yolo Bypass, and the Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and the San Francisco Bay to the Pacific Ocean, as a result of these hydraulic changes. The three Project intakes would also affect the amount of sediment and water in the river downstream of each diversion.

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[2] Other river systems within the Secondary and Extended study areas would experience impacts, but the impacts to the other river systems are considered to be less than significant because impacts to the Sacramento River are considered less than significant.

Modeling results indicate that the effects of Alternative A on the Sacramento River would include a slight decrease in suspended sediment load and bed load (because of reduced flow and bed mobility) in the Sacramento River downstream of the Red Bluff Pumping Plant, GCID Canal, and the Delevan Pipeline intakes, mostly during winter months. The expected amount of sediment that would be entrained in these proposed intakes would be less than one percent of the existing changes in sediment deposition into the Delta.

The estimated average amount of suspended sediment currently moving in the river past the Bend Bridge gage is approximately 2.01 million tons (USACE, 1983). The average amount of suspended sediment that would be entrained at the Red Bluff Pumping Plant annually if Alternative A is implemented is estimated to be approximately 46,000 tons per year, as compared to 4,000 tons estimated for Existing Conditions and the No Project/No Action Alternative (Appendix 8A). Therefore, implementation of Alternative A would decrease the amount of suspended sediment in the Sacramento River downstream of the Red Bluff Pumping Plant by approximately 2.3 percent, as compared to the 0.2 percent decrease associated with Existing Conditions and the No Project/No Action Alternative at this location.

The amount of sediment that would be entrained at the GCID Canal Intake if Alternative A is implemented is estimated to be approximately 53,000 tons per year (Appendix 8A), as compared to 44,000 tons estimated for Existing Conditions and 47,000 tons estimated for the No Project/No Action Alternative. Therefore, implementation of Alternative A would decrease the amount of sediment in the Sacramento River downstream of Hamilton City by approximately 1.4 percent, as compared to the 1.1 percent decrease associated with Existing Conditions and the 1.2 percent decrease associated with the No Project/No Action Alternative at this location. At Hamilton City, there is a large component of flow and sediment that goes overbank during large flood events, so the actual percentage would be less.

The estimated annual amount of suspended sediment moving in the Sacramento River past the Butte City gage, which is approximately 10 miles upstream of the proposed Delevan Pipeline Intake location, is estimated at 4.32 million tons (USACE, 1983).Modeling results indicate that the amount of suspended sediment that would be entrained at the Delevan Pipeline Intake would be approximately 47,000 tons (Appendix 8A), representing approximately 1.1 percent of the amount of suspended sediment in the Sacramento River at that location. This intake is considered part of the Primary Study Area, but the downstream effects would occur in the Secondary Study Area.

The diverted suspended sediment at the three intake locations would be less than two percent of the total suspended sediment moving in this reach of the river. However, because the water and sediment would both be diverted, the concentration of the sediment in the water would remain unchanged, so there would be a **less-than-significant impact** on sediment concentration, turbidity or water clarity, when compared to Existing Conditions and the No Project/No Action Alternative.

The loss of suspended sediment would affect the river, floodplain, overflow areas, weirs, bypasses, the Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and the Pacific Ocean by reducing the amount of deposition in these areas. The impacts of the loss of suspended sediment at the existing Red Bluff Pumping Plant would occur in the Sacramento River from Red Bluff and downstream. The loss of suspended sediment at the existing GCID Canal Intake would occur in the Sacramento River from Hamilton City and downstream, and the loss of suspended sediment at the proposed Delevan Pipeline Intake would occur in the Sacramento River from the vicinity of Princeton and downstream. The effects would be considered **beneficia**l in some places, when compared to Existing Conditions and the No

Project/No Action Alternative, by reducing suspended sediment that could deposit in spawning gravel, agricultural fields, navigable waters, and in weirs and bypasses.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Compared to Existing Conditions and/or the No Project/No Action Alternative, implementation of Alternative A is expected to affect natural Sacramento River meandering, bank erosion, and deposition, with consequent effects on riparian vegetation.

The installation of the fish screen at the proposed Delevan Pipeline Intake would be functionally equivalent to bank protection, and may affect meandering downstream of the diversion. However, the bank at this location consists of geologic control (erosion resistant unit). In addition, the existing Maxwell ID Pumping Plant, located immediately upstream of the proposed Delevan Pipeline Intake location, is located in a narrow section of the river and consequently acts as a local flow control point (Reclamation, 2012). Therefore, a **less-than-significant impact** is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Bank protection installed in the mid-1980s exists on the right bank in the bend upstream of the diversion, stabilizing the bend. This riprap does not protect the entire bend, and the potential for a partial cutoff exists.

The changes in streamflow downstream of Keswick Dam and the three Project intakes would also have effects on bank erosion. Decreased flows would potentially reduce the amount of sediment delivered to the Sacramento River from this source, at least directly downstream of the intakes. The largest effect would be associated with the existing Red Bluff Pumping Plant because of the 100 miles of meandering river occurring between the intake to the end of the meandering reach at the town of Colusa. The GCID Canal Intake would affect approximately 50 miles of meandering river, and the Delevan Pipeline Intake would have the least operational effect, affecting only approximately 10 miles of the Sacramento River, located downstream of the proposed intake.

The Reclamation meander study produced flow duration curves that indicate only minor differences in flow would occur between Existing Conditions, the No Project/No Action Alternative, and Alternative A. Most of the flow differences would occur below the threshold flow of 30,000 cfs, which is the flow above which significant geomorphologic river changes typically begin to occur.

The differences in channel migration between the Existing Conditions, the No Project/No Action Alternative, and Alternative A would be small. There would be a slight increase in bank erosion and meander rates with Alternative A (Appendix 8A). This is considered a **beneficial effect**, when compared to Existing Conditions and the No Project/No Action Alternative, because it would result in more benefits to riparian vegetation, fish, and wildlife because of a slight increase in floodplain rejuvenation.

Meandering is beneficial because it maintains forest health, complexity, and diversity by removing late stage older riparian vegetation, such as cottonwood forests on one side of the river, and replacing them with younger stages such as willow shrub on the other side. Trees, rootwads, and gravel (used by salmonids for habitat and spawning) would be introduced into the river and would also provide habitat for a variety of other fish and wildlife.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the riparian vegetation along the Sacramento River would increase or remain similar with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

It would typically be expected for the meander rates to decrease locally downstream of the Sacramento River winter diversions as a result of implementing Alternative A because the water diverted would reduce streamflow. However, this does not appear to be the case. The hydraulic modeling showed that the coordinated operation of the proposed Sites Reservoir and Shasta Lake would generally result in higher Shasta Lake storage in the late summer and early fall, and higher Keswick Dam releases in the fall and winter. Therefore, there would be a slight increase in the incidence of high flow events upstream of the intakes. The expected increase in flows upstream of the intakes, combined with the expected decrease in flows downstream of the intakes (due to diversion of excess flows primarily from tributaries), generally do not coincide. Therefore, it is expected that flow levels that are effective at increasing meander rates would increase slightly.

Alternative A would slightly increase erosion and slightly reduce sediment deposition. The change in the erosion-deposition balance with implementation of Alternative A would be small and is considered to be **less than significant** when considering the large natural fluctuations in these two parameters, and when compared to Existing Conditions and the No Project/No Action Alternative.

Downstream of Colusa, meandering would not occur to any significant degree because the river is confined by levees. Reduction of suspended sediment resulting from Alternative A downstream of Colusa is considered to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative, because the river is isolated by levees from its floodplain, and sediment deposition in the overflow areas is not considered environmentally beneficial. The weirs, bypasses, and overflow areas would benefit from the reduced deposition associated with operation of Alternative A because periodic removal of sediment is required to maintain their proper function.

Reduced suspended sediment supply has the potential to affect the replenishment of sand on ocean beaches south of San Francisco. However, the Sacramento and San Joaquin rivers are not significant suppliers of sand to the beaches, partly because of the many dams on those rivers, and also because of the low gradient through the Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay to the Pacific Ocean. All but the very fine sediment drops out before reaching the ocean. Other streams that feed directly into the ocean, such as the Klamath, Mad, Van Duzen, Eel, Russian, and other smaller rivers, provide the majority of the sand to beaches. **No impact** would occur to sand deposition on beaches depending on these rivers, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

Compared to Existing Conditions and/or the No Project/No Action Alternative, Alternative A would result in impacts on fish and wildlife habitat by affecting the amount of large woody debris, shaded riverine aquatic habitat, and spawning gravel in the river. The slight increase in bank erosion would increase the number of trees in the river used by fish as cover and holding habitat, and the amount of gravel used for spawning. The gravel would become part of the sediment supply in the river, and would move as bedload. The bedload would deposit on riffles where salmon build their nests and deposit their eggs.

Modeling performed using SacEFT indicates that the large woody debris recruitment to the Sacramento River would remain similar with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

It is not certain how Alternative A would affect the shaded riverine aquatic habitat that occurs along the banks of a stream; however, it is expected that the increased bank erosion would result in improved riparian forest health.

No bedload is expected to be entrained in the three Project intakes, but the reduced flow downstream of those intakes would reduce the mobility of the bedload in the channel. This may have a slight aggradational effect to the channel downstream of each intake because bedload derived from bank erosion and tributaries would continue to move into the area. This would be a **beneficial effect** to salmon spawning gravel riffle habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Bedload is the main source of spawning gravel for salmonids. The salmon depend on fresh gravel, free from fine sediment, to deposit their eggs. Bedload movement on a periodic basis is important in maintaining high spawning gravel quality. Bedload deposition is also important in maintaining hydraulic diversity. Islands, point bars, and multiple channels provide a variety of habitat elements for the fish and wildlife.

Reclamation modeling of the movement of bedload sediment for Alternative A indicates that the bedload transport capacity upstream of the Red Bluff Pumping Plant intake would increase by two to six percent, and would decrease by approximately two percent downstream (Appendix 8A). Alternative A would affect the movement of gravel and the overall bedload budget by less than five percent, which is considered to not significantly affect the bedload sediment balance in the Sacramento River. Some aggradation and degradation would occur in the different reaches; the amounts are small, less than 0.1 inch per year (Appendix 8A).

The GCID Canal Intake has an existing bedload deposition problem at the mouth of the river intake channel. Dredging to remove these deposits currently occurs infrequently, every five years or so. Implementation of Alternative A may slightly increase the frequency and amount of dredging that would need to occur. Similar maintenance activities may be required at the Red Bluff Pumping Plant and the Delevan Pipeline Intake. If the gravel is removed from the river permanently, it is a negative impact. However, the gravel may be spread on point bars downstream of the intakes, essentially re-introducing the gravel and minimizing the effects of this activity. Modeling results (Appendix 8A) indicate that the change in hydrology that would be associated with the operation of Alternative A would result in a **less-than-significant impact** on bedload movement, when compared to Existing Conditions and the No Project/No Action Alternative.

The slight increase in bank erosion rates mentioned previously (Appendix 8A) is expected to have a slightly **beneficial effect** on riparian vegetation over the long-term, when compared to Existing Conditions and the No Project/No Action Alternative. Increased erosion would result in more of the floodplain being converted back to riparian vegetation. Shaded riverine aquatic habitat would also increase because more of the floodplain would be occupied by riparian forests, and more woody material and spawning gravel would be introduced to the river.

8.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Delevan Pipeline Intake Facilities

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

The only location along the Sacramento River where Alternative A construction, operation, and maintenance activities would occur, and where impacts from/to Sacramento River fluvial geomorphology would occur, is at the proposed Delevan Pipeline Intake Facilities location.

The proposed pump station and afterbay would be located on erosion resistant deposits (referred to as geologic control) of the Modesto Formation. The proposed fish screen, floodgates, and pipes leading to the afterbay, would be located on river deposits in the 1896 to 1937 channel alignment (Figure 8-3).

When compared to Existing Conditions and/or the No Project/No Action Alternative, the proposed fish screens, as part of Alternative A, would stabilize a short section of bank, and are expected to be the only feature that could affect Sacramento River geomorphology directly. However, the bank where the fish screens would be constructed is considered to be geologic control and not part of the meander belt. The construction of the screens would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Refer to the **Impact Geom-1** discussion for the Sacramento River within the Secondary Study Area for a discussion of the operation and maintenance impacts associated with the two existing intakes (Red Bluff Pumping Plant and GCID Canal) and the proposed Delevan Pipeline intake. There may be some minor changes in sediment levels and local flow around the proposed Delevan Pipeline Intake construction area, when compared to Existing Conditions and/or the No Project/No Action Alternative. These changes in sediment and flow would not affect the local geomorphology in the Sacramento River and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

The proposed fish screens would result in the local removal of riparian vegetation along this short length of bank, reducing habitat complexity, when compared to Existing Conditions and/or the No Project/No Action Alternative. The impact would be slight and is considered to be **less than significant**.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

The bank where the proposed Delevan Pipeline Intake fish screens would be located consists of geologically stable units that do not erode significantly. The reduction in spawning gravel and fish habitat would be slight, when compared to Existing Conditions and/or the No Project/No Action Alternative, and is considered to be a **less-than-significant impact**.

8.3.7 Impacts Associated with Alternative B

8.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to natural river processes and characteristics (**Impact Geom-1**), riparian vegetation and habitat complexity (**Impact Geom-2**), and fish habitat (**Impact Geom-3**), would be the same as described for Alternative A for the Extended Study Area.

8.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B operations, as they relate to natural river processes and characteristics (**Impact Geom-1**), riparian vegetation and habitat complexity (**Impact Geom-2**), and fish habitat (**Impact Geom-3**), would be the same as described for Alternative A for Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction impacts associated with the pump installation at the Red Bluff Pumping Plant.

Operational impacts associated with implementation of Alternative B to the Sacramento River downstream of Shasta Dam to the Pacific Ocean are discussed below.

Sacramento River

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

Suspended sediment entrained into the existing Red Bluff Pumping Plant would be somewhat higher for Alternative B than that described for Alternative A (approximately 58,000 tons per year instead of 46,000 tons) (Appendix 8A) because of the larger diversion amounts that would be needed to fill the larger 1.8 MAF Sites Reservoir, and because the Delevan Pipeline Intake would be replaced by the release-only Delevan Pipeline Discharge Facility.

The amount of suspended sediment entrained at the existing GCID Canal Intake, as a result of Alternative B, also would be a little higher than for Alternative A (64,000 instead of 53,000 tons per year), but no sediment would be entrained at the proposed Delevan Pipeline Discharge Facility because there would be no intake there. These impacts would extend downstream in the Secondary Study Area, primarily in the Sacramento River downstream of Hamilton City through the Delta and to the Pacific Ocean. Although Alternative B impacts would be slightly larger to the meandering reach of the river than Alternative A because the water is removed farther upstream in the system, Alternative B operation would still result in a **less-than-significant impact** on the amount of suspended sediment when compared to the large amount of sediment moving in the river (as described in the Alternative A analysis), when compared to Existing Conditions and the No Project/No Action Alternative.

The movement of bedload downstream of the two existing intakes would decrease slightly, when comparing Alternative B to Alternative A because of the reduced flow in the channel. The impact of the reduced bedload movement is considered to be **less than significant** for Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Because of the slight differences in the hydrology between Alternative A and Alternative B, the differences in meandering, bank erosion and deposition are also slight. Alternative B would result in less natural river meandering than Alternative A, which would result in less bank erosion and deposition, with less consequent alteration of riparian vegetation regeneration and habitat complexity. The meandering is only slightly more for Alternative B than for Existing Conditions and the No Project/No Action Alternative. As discussed for Alternative A, these differences are considered to be small, when compared to the natural variation in these parameters. Therefore, the consequent alteration of riparian vegetation regeneration and habitat complexity is considered to be **beneficial, but less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the riparian vegetation along Sacramento River would increase or remain similar with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative. The only exception is that the SacEFT indicates that there would be a slightly higher number of years with post-initiation scour risk for Fremont Cottonwood seedlings with implementation of Alternative B, when compared to the No Project/No Action Alternative.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

Alternative B would affect large woody debris, shaded riverine aquatic habitat, and spawning gravel in the Sacramento River, which could result in a loss of fish rearing, holding, spawning, and feeding habitat. However, modeling performed using SacEFT indicates that the large woody debris recruitment to the Sacramento River would remain similar with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative. As discussed for Alternative A, implementation of either of these action alternatives would result in a slight increase in bank erosion and meandering (Appendix 8A), when compared to Existing Conditions and the No Project/No Action Alternative, resulting in a **less-than-significant, but beneficial, impact** due to the increase in large woody debris, shaded riverine aquatic habitat, and spawning gravel in the river.

8.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

Delevan Pipeline Discharge Facility

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

As described for the Delevan Pipeline Intake Facilities, the Delevan Pipeline Discharge Facility would also be located on geologic control outside of the Sacramento River meander belt. The discharge facility would have no associated fish screens, and therefore, would not extend into the river, but would require a cofferdam that would extend into the river during Project construction. However, the construction area would also be located on geologic control. The discharge facility would be operated as a release-only facility, and would, therefore, not entrain sediment during operation or require the maintenance activity of sediment removal that was described for the intake facility associated with Alternative A. Construction, operation, and maintenance of the Delevan Pipeline Discharge Facility would, therefore, result in a

less-than-significant impact to Sacramento River geomorphology in the Primary Study Area, when compared to Existing Conditions and/or the No Project/No Action Alternative.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

The proposed discharge facility would result in less riparian vegetation being removed along this length of bank when compared to Alternative A. Because of the short length of bank affected, the impact would be slight and is considered to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

The bank where the proposed Delevan Pipeline Discharge Facility would be located consists of geologically stable units that do not erode significantly. The reduction in fish habitat resulting from the loss of a small amount of shaded riverine aquatic habitat would be slight, when compared to Existing Conditions and/or the No Project/No Action Alternative, and is considered to be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

8.3.8 Impacts Associated with Alternative C

8.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to natural river processes and characteristics (**Impact Geom-1**), riparian vegetation and habitat complexity (**Impact Geom-2**), and fish habitat (**Impact Geom-3**), would be the same as described for Alternative A for the Extended Study Area.

8.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C operations, as they relate to natural river processes and characteristics (**Impact Geom-1**), riparian vegetation and habitat complexity (**Impact Geom-2**), and fish habitat (**Impact Geom-3**), would be the same as described for Alternative A for Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

Operational impacts associated with implementation of Alternative B for the Sacramento River downstream of Shasta Dam to the Pacific Ocean are discussed below.

Sacramento River

Impact Geom-1: Substantial Alteration of Natural River Processes and Characteristics

The implementation of Alternative C would alter hydraulic conditions in the Sacramento River and result in changes to natural river processes and characteristics such as bank erosion, sinuosity, gradient, flow velocity, sediment transport, bed coarseness, depth, and width.

The impacts to hydrology from operation of Alternative C would be slightly larger than for Alternative A because the larger reservoir associated with Alternative C would allow more diversions to occur, which could increase the amount of diverted sediment. However, as discussed for Alternative A, the diverted suspended sediment at the three Project intake locations would represent a small percentage of the total suspended sediment in this reach of the river, and because the water and sediment would both be diverted, the concentration of the sediment in the water would remain unchanged. There would, therefore, be a **less-than-significant impact** to the Sacramento River natural river processes, such as bank erosion, sinuosity, gradient, flow velocity, sediment transport, bed coarseness, depth, and width, when compared to Existing Conditions and the No Project/No Action Alternative.

The movement of bedload downstream of the two existing intakes would be similar, when comparing Alternative C to Alternative A, because of similar flow in the channel, and is considered to be **less than significant** for Alternative C, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-2: Substantial Alteration of Natural River Meandering, Bank Erosion, and Deposition, and Substantial Alteration of Riparian Vegetation and Habitat Complexity

Alternative C would result in a slight increase in natural meandering, bank erosion, and deposition, with a consequent slight increase in riparian vegetation regeneration and habitat complexity, when compared to the No Project/No Action Alternative. The accumulated channel migration distance (Appendix 8A) showed the results of the meander modeling for Alternative A. Alternative C would result in less channel migration distance than Alternative A, but more than Alternative B. All three action alternatives would differ by less than 10 feet of channel migration for the 30-year model period. The average meander distance would be approximately 175 feet for all three alternatives, with an associated potential increase of approximately a maximum of six percent. This is considered a beneficial effect to the environment, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geom-3: Substantial Alteration of the Amount of Large Woody Debris, Boulders, Shaded Riverine Aquatic Habitat, or Spawning Gravel in Rivers, with Effects on Fish Habitat

Modeling performed using SacEFT indicates that the large woody debris recruitment to the Sacramento River with implementation of Alternative C would be the same as described for Alternative A. As discussed for Alternative A, implementation of either of these action alternatives would result in a slight increase in bank erosion and meandering (Appendix 8A), when compared to Existing Conditions and the No Project/No Action Alternative, resulting in a **less-than-significant, but beneficial, impact** due to the increase in large woody debris, shaded riverine aquatic habitat, and spawning gravel in the river.

8.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

Similar to Alternative A, Alternative C would include the Delevan Pipeline Intake Facilities within the Primary Study Area. The impacts associated with Alternative C, as they relate to natural river processes and characteristics (**Impact Geom-1**), riparian vegetation and habitat complexity (**Impact Geom-2**), and fish habitat (**Impact Geom-3**), would, therefore, be the same as described for Alternative A for the Primary Study Area.

8.4 Mitigation Measures

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

8.5 References

California Department of Water Resources (DWR). 2010. *Sacramento River Bank Erosion Investigation - Red Bluff to Colusa, California*. Northern Region Office District Draft Report. 206p. June. Page cited: 181.

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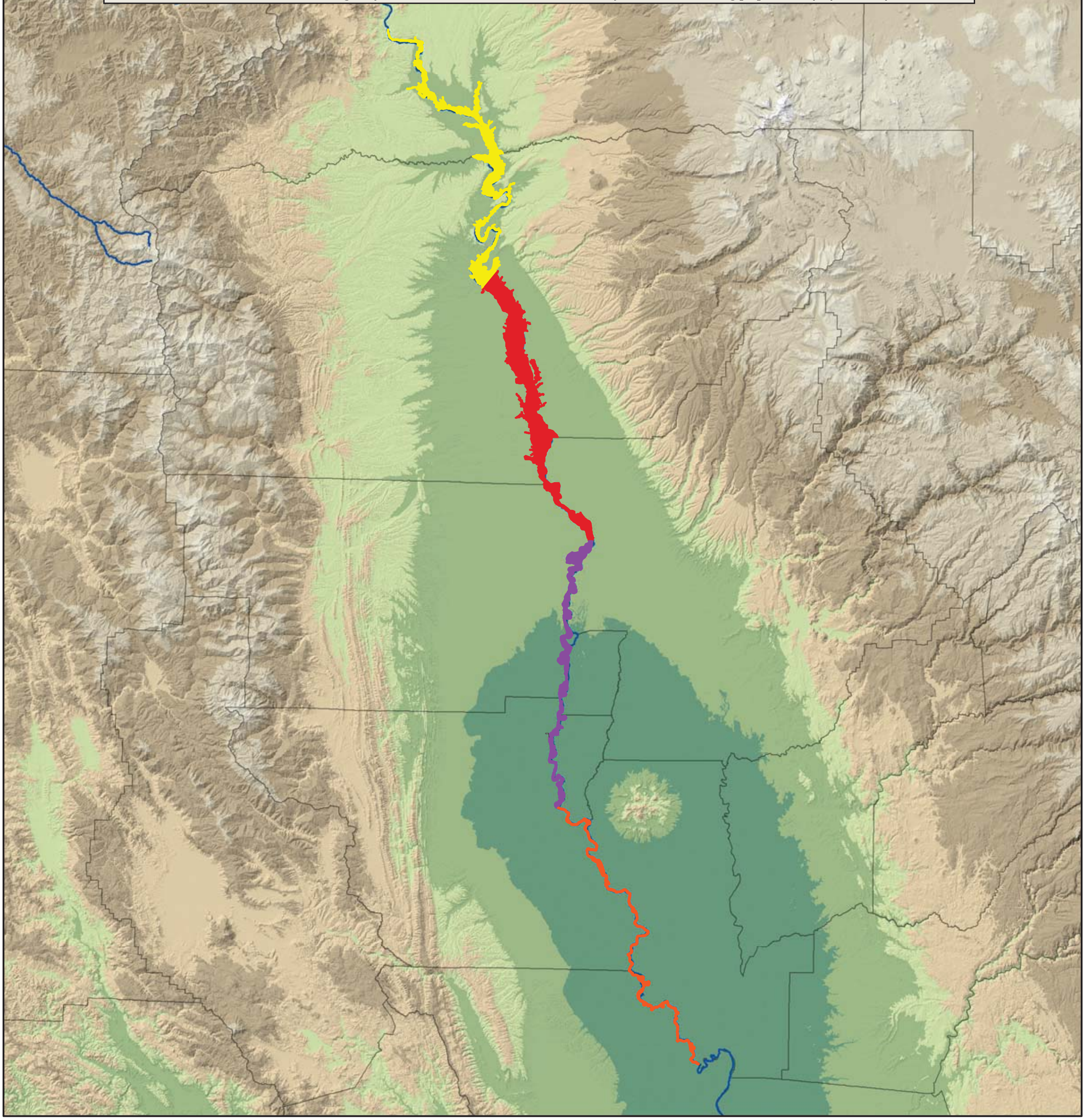
U.S. Army Corps of Engineers (USACE). 1983. *Sediment Transport Studies*. Sacramento River and Tributaries Bank Protection and Erosion Control Investigation, California. Sacramento District. 60 p. plus figures. August. Pages cited: Figure 10 in Appendix.

U.S. Geological Survey (USGS). 1977. *Lateral Migration of the Middle Sacramento River, California*. Water Resources Investigation 77-43. 51 p. Pages cited: 43 and 50.

Figures

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.



Legend

Sacramento River Reaches

- Keswick Dam to Red Bluff Diversion Dam
- Red Bluff Diversion Dam to Chico Landing (RM 193)
- Chico Landing (RM 193) to Colusa Bridge
- Colusa Bridge to Verona (Confluence with the Feather River)
- Rivers

FIGURE 8-1
Sacramento River Reaches
North-of-the-Delta Offstream Storage Project

N

0 5 10 20 30 Miles

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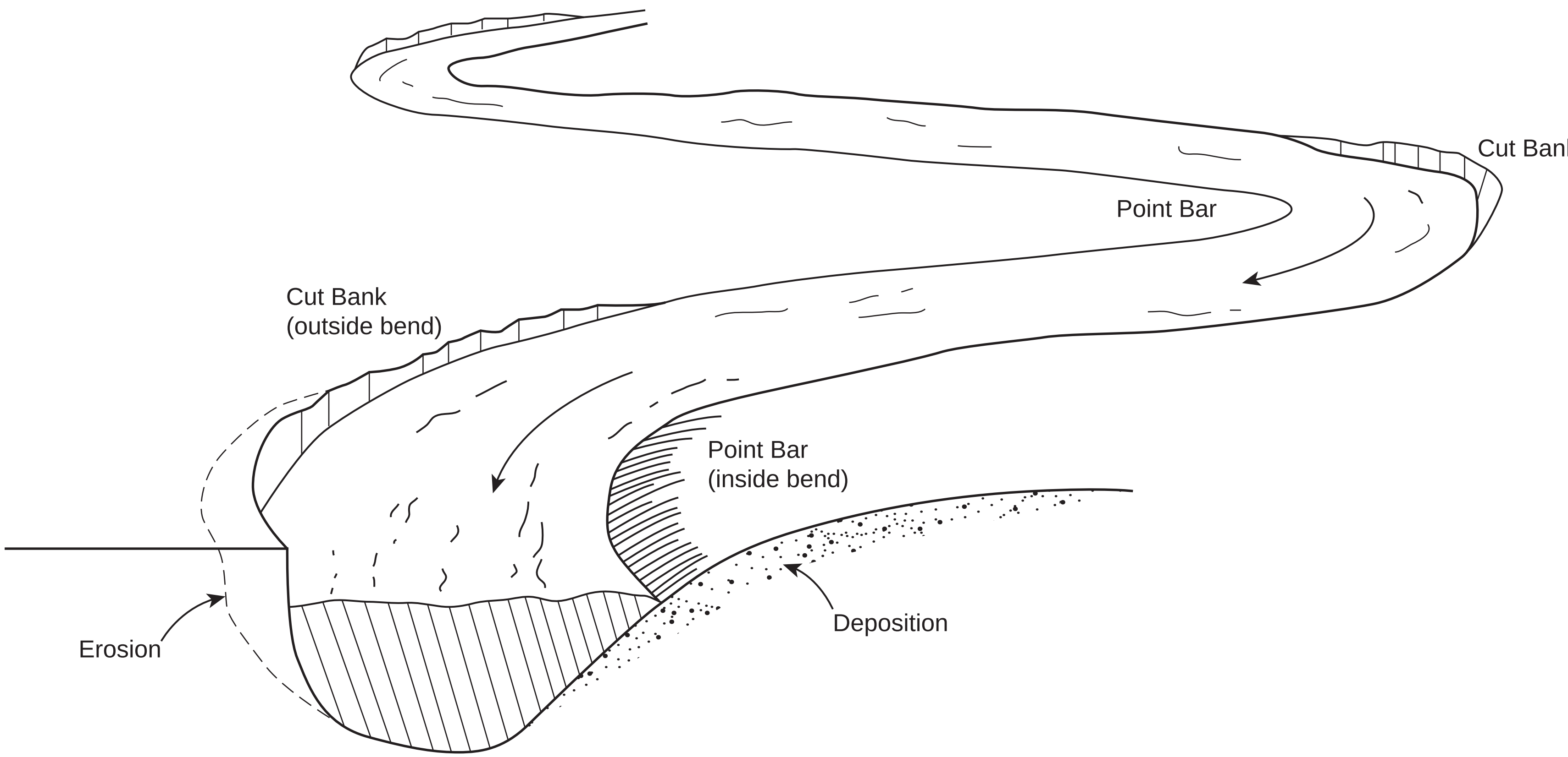

FIGURE 8-2
Typical Bend on a Meandering River
North-of-the Delta Offstream Storage Project

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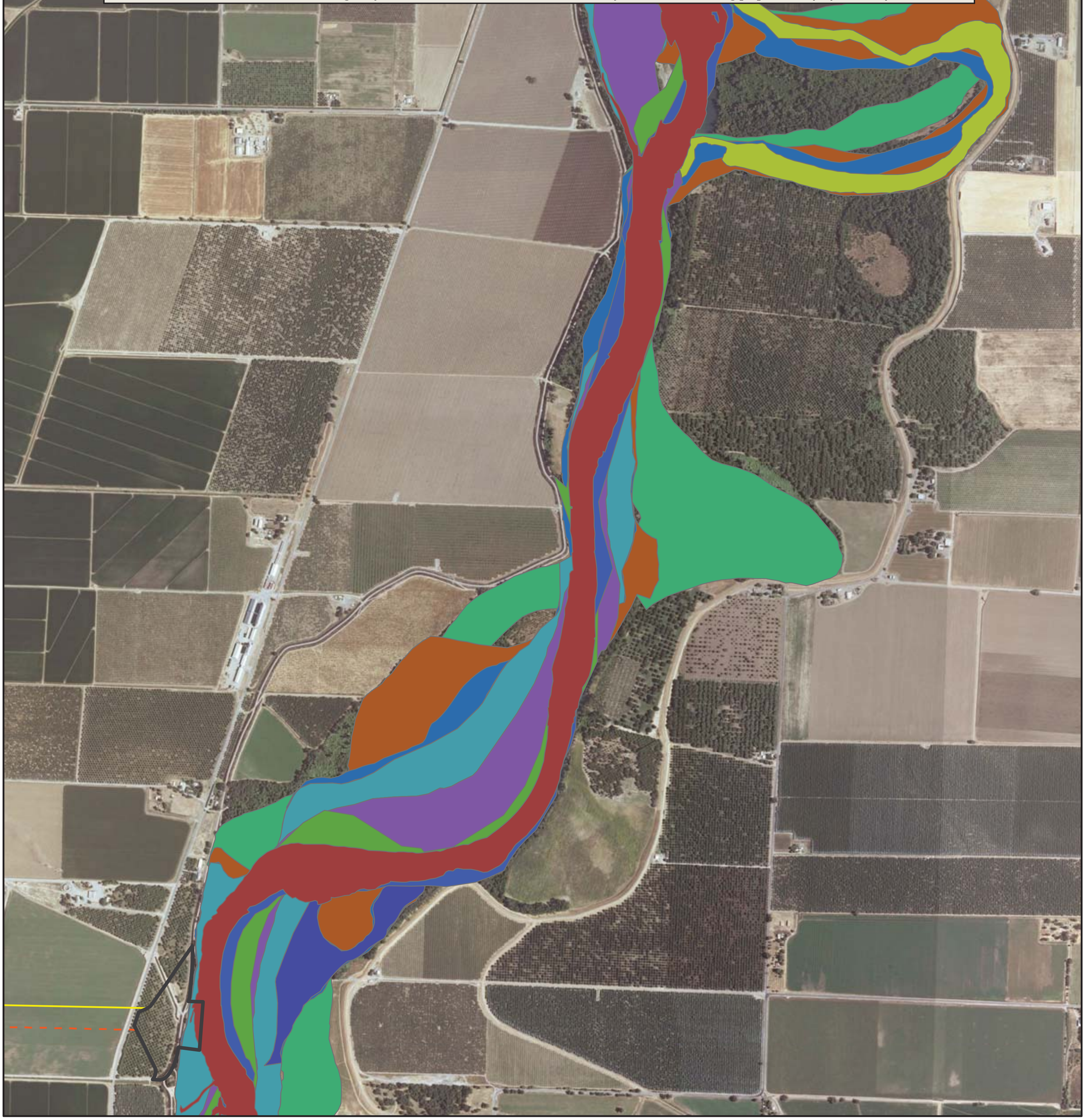

Legend

Historic River Channels by Year

- 1896
- 1908
- 1923
- 1935
- 1937
- 1946
- 1955
- 1956
- 1960
- 1964
- 1969
- 1976
- 1981
- 1991
- 1997

- Delevan Pipeline Intake Structure
- Delevan Transmission Line
- Delevan Pipeline

FIGURE 8-3
Sacramento River Channel Changes At and Near River Mile 158.5

North-of-the-Delta Offstream Storage Project

0 500 1,000 2,000 3,000 Feet

N

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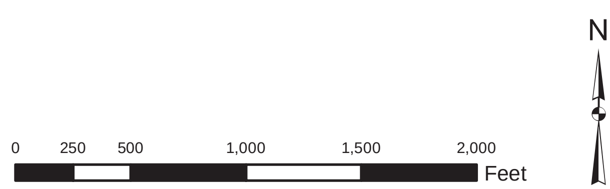
Legend

- Delevan Pipeline Intake Structure
- Delevan Transmission Line
- Delevan Pipeline

FIGURE 8-4
Gravel Bars and Mid-Channel Islands Near River Mile 158.5
North-of-the-Delta Offstream Storage Project



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9. Flood Control and Management

9.1 Introduction

This chapter describes the flood hydrology, control, and management system in the Primary, Secondary, and Extended study areas, with particular focus on the Primary Study Area and Sacramento River Basin. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for flood hydrology, control, and management is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary Study Area, particularly related to the Sacramento River Flood Management System, were evaluated and discussed qualitatively. The portions of the Extended Study Area that are located outside of the Project flood control and management impacted areas were not evaluated or discussed. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

9.2 Affected Environment

This section describes flood control and management facilities in the three study areas, with particular focus on the Primary Study Area (including local flood management facilities) and the Secondary Study Area (including the Sacramento River flood management system).

9.2.1 Extended Study Area

The Extended Study Area includes the entire statewide CVP and SWP service areas. This study area is extensive and includes hundreds, if not thousands, of federal, State, regional and local flood control and management facilities. This study area encompasses the CVP and SWP service areas outside of the greater Sacramento River Basin and south of the Sacramento-San Joaquin Delta. The only Extended Study Area reservoir included in Project operations modeling is San Luis Reservoir. However, San Luis Reservoir is operated entirely as a joint CVP and SWP supply storage reservoir and is not operated for flood control purposes. The portions of the Extended Study Area that are outside of the greater Sacramento River Basin, and south of the Sacramento-San Joaquin Delta, would also be outside of the affected environment for Project flood impacts, and are, therefore, not discussed.

9.2.2 Secondary Study Area

9.2.2.1 Sacramento River Flood Control and Management

The Sacramento River flood control and management system is a complex network of dams and reservoirs, levees, weirs, bypasses and other flood control features. A portion of this complex flood protection system includes State- and federally-authorized projects for which the Central Valley Flood Protection Board (CVFPB) or DWR has provided assurances of cooperation to the federal government. This portion of the flood protection system is known as the State Plan of Flood Control (SPFC). A summary of features of the SPFC is provided in Figure 9-1.

The CVFPB or DWR has not provided assurances of cooperation for all parts of the flood protection system. Projects without CVFPB or DWR assurances are not part of the SPFC (i.e., they are non-SPFC facilities). Although these facilities are not part of the SPFC, their operation may influence operation of the SPFC, especially in reducing peak flood flows through the SPFC levee system. Non-SPFC facilities include multipurpose reservoir projects (with the exception of Lake Oroville, which is the only major multipurpose project discussed in this chapter that is part of the SPFC), local and regional projects, non-project levees, local pumping plants, and State-designated floodways (DWR, 2010).

Multipurpose flood management reservoirs in the greater Sacramento River Basin are listed in Table 9-1 in chronological order of construction.

Table 9-1
Sacramento River Basin Multi-Purpose Flood Management Reservoirs

Reservoir	Total Reservoir Capacity (acre-feet)	Maximum Flood Storage Capacity (acre-feet)	Operator
Shasta	4,550,000	1,300,000	Reclamation
Black Butte	160,000	137,000	USACE
Folsom	1,010,000	650,000	Reclamation
Oroville	3,540,000	750,000	DWR
New Bullards Bar	960,000	170,000	Yuba County Water Agency
Indian Valley	300,000	40,000	Yolo County Flood Control and Water Conservation District

Notes:

USACE = U.S. Army Corps of Engineers
DWR = California Department of Water Resources
Reclamation = U.S. Bureau of Reclamation

Other major SPFC facilities in the Sacramento River flood control and management system include project levees and flood control weirs, as shown on Figures 9-2A and 9-2B. These figures also indicate system capacities and flood flow routing.

The 100-year floodplain delineations for the Sacramento River Valley north of the Sacramento-San Joaquin Delta are illustrated on Figure 9-3. Major federal, State and local non-SPFC projects impacting flood hydrology or providing flood management for the Sacramento Valley are located on the Trinity River, Sacramento River, Feather River, American River and within the Delta. These areas are discussed below.

9.2.2.2 Trinity River (Including Trinity Lake, Lewiston Lake, Whiskeytown Lake, Clear Creek and Spring Creek)

The Trinity River is the largest tributary to the Klamath River. The Trinity River Diversion includes Trinity Dam, Lewiston Dam, and facilities to transfer water from the Trinity River Basin to the Sacramento River Basin. Trinity Dam was completed in 1962. The dam forms Trinity Lake, which has a capacity of approximately 2.4 MAF. Releases from Trinity Dam are regulated downstream at Lewiston Lake for downstream flow requirements and diversions through the Clear Creek Tunnel to Whiskeytown Lake on Clear Creek. From Whiskeytown Lake, water is delivered through the Spring Creek tunnel to Keswick Reservoir. The outflow from Trinity and Lewiston reservoirs provides water to meet temperature objectives for special-status fish species in the Trinity and upper Sacramento rivers (Reclamation, 2009).

Flood control was not an original project purpose of the two dams. However, because of its large storage and spillway surcharge capacities, Trinity Lake has the potential to provide flood control storage, and Reclamation’s Safety of Dams criteria stipulate flood control releases November through March if the overall storage is forecasted to exceed 2.0 MAF (Reclamation, 2004). In addition, Trinity Lake is operated in conjunction with Shasta Lake, when necessary, as part of Shasta's Sacramento River flood control operations.

9.2.2.3 Sacramento River (Including Shasta Lake and Keswick Reservoir)

A complex system of dams and associated reservoirs, levees, weirs, bypasses and other features have been constructed over the last 150 years to help manage flooding along the Sacramento River. The primary flood control features on the Sacramento River system are Shasta Lake and the federally authorized Sacramento River Flood Control Project.

Regulating inflows from the Sacramento, McCloud, and Pit rivers, Shasta Lake provides flood control to the upper Sacramento River through Shasta Lake's 1.3-MAF of flood control storage. The reservoir is managed for flood control from October 1 through March 30. In non-emergency flood conditions, Shasta Dam releases are restricted to 79,000 cfs at the tailwater of Keswick Dam (79,000 cfs is the estimated safe channel carrying capacity of the Sacramento River downstream of Keswick through Redding) and by a flood stage of 27.0 feet at the Sacramento River at Bend Bridge gage (flood stage of 27.0 ft equates to approximately 100,000 cfs). The Sacramento River at Bend Bridge is a key Sacramento River flood forecasting point. The Sacramento River Flood Control Project area spans from Red Bluff to Verona (north of Sacramento on the Sacramento River) and includes levees, cleared channels, bypasses, and overflow flood control facilities (Figures 9-2A and 9-2B).

The Chico Landing to Red Bluff reach of the Sacramento River (RM 194 to RM 244) is relatively unaffected by flood control facilities. The river naturally meanders through alluvial deposits, and tributaries contribute unregulated flood inflows. This reach of the Sacramento River Flood Control Project was authorized in 1958 for bank protection and incidental channel modification. Floodway designation and floodplain planning and zoning are used to prevent encroachment into the natural floodplain. Most of the floodplain along this reach is used primarily for either agricultural production or riparian habitat. The 100-year floodplain can range up to four miles wide. Some rural residential development has occurred along the river, with concentrated urban development around the City of Tehama and Hamilton City. The design flow of the river upstream of Chico Landing is 260,000 cfs.

The Colusa to Chico Landing reach of the Sacramento River (RM 143 to RM 194) consists of levees and overflow areas. Black Butte Reservoir regulates Stony Creek flood flows, which enter the Sacramento River downstream of Hamilton City. Right bank levees extend south from Ord Ferry through Colusa to prevent Sacramento River flood water from entering the Colusa Basin, except when flows exceed 300,000 cfs near Ord Ferry (USACE, 1999). Three flood relief weirs, downstream of Chico Landing, spill flood flows to the Butte Basin Overflow Area, which consists of lands that have historically flooded prior to flood control development. The left bank levee begins midway between Ord Ferry and Butte City and extends south through Verona. The leveed capacity of the Sacramento River near Butte City is 160,000 cfs. Moulton and Colusa weirs divert flood flows to the Butte Basin Overflow Area at RM 158 and 146, respectively. The capacity of Moulton and Colusa weirs is 25,000 and 70,000 cfs, respectively. These weirs provide relief to meet the downstream river capacity of 65,000 cfs at Colusa.

The natural Sutter Basin overflow to the east of the Sacramento River and downstream of the Sutter Buttes was included in the Sacramento River Flood Control Project by confining the extent of overflow through a leveed bypass. The Sutter Bypass conveys floodwaters from the Butte Basin Overflow Area, Butte Creek, Wadsworth Canal, Reclamation Districts 1660 and 1500 drainage plants, State drainage plants 1, 2 and 3, and Tisdale Weir to the juncture of the Sacramento and Feather rivers. The capacity of the Sutter Bypass is 216,000 cfs upstream of its juncture with the Feather River, where the combined capacity of the Feather River and Sutter Bypass is 416,500 cfs upstream of its confluence with the Sacramento River at Fremont Weir and the Yolo Bypass.

The natural Yolo Basin overflow to the west of the Sacramento River was included in the Sacramento River Flood Control Project by confining the extent of overflow through a leveed bypass. The Yolo Bypass conveys floodwaters around the Sacramento metropolitan area and reconnects to the Sacramento River at Rio Vista (RM 14), near Suisun Bay (USACE, 1999). Overflow into the Bypass occurs at Fremont Weir to the north and at Sacramento Weir near Sacramento. Fremont Weir flow begins when flows in the Sacramento River reach 62,000 cfs. Capacity of the Bypass increases from 343,000 cfs at Fremont Weir to 500,000 cfs near the bypass’ mouth at Rio Vista.

The Verona to Colusa reach (RM 98 to RM 143) consists of a leveed river channel. Downstream of Colusa, Tisdale Bypass routes a portion of the river flow in excess of 23,000 cfs at Tisdale Weir (RM 119) to the Sutter Bypass (USACE, 1999). Reclamation Districts 70, 108, and 787 pump flood waters from adjacent closed basin lands into the river. The Knights Landing Outfall is a gravity flow structure and prevents the Sacramento River from flowing into the Colusa Basin. The Knights Landing Ridge Cut conveys Colusa Basin drainage and flood flows into the Yolo Bypass several miles downstream of Fremont Weir. Flood flows passing through the Knights Landing Ridge Cut are somewhat restricted at times by backwater conditions when the Yolo Bypass is at full capacity. Sources of bypass inflow downstream of the Knights Landing Ridge Cut include the Cache Creek Detention Basin, Willow Slough, Putah Creek, and Sacramento Weir (combination of Sacramento and American river flood flows). Near Verona, the Sacramento River, Feather River, Sutter Bypass, and Natomas Cross Canal join together, and flows in excess of 62,000 cfs spill into the Yolo Bypass at Fremont Weir.

Downstream of Verona, the leveed Sacramento River winds its way past the City of Sacramento to the Sacramento-San Joaquin Delta. The Yolo Bypass is located to the west of the river. The Sacramento Bypass routes excess flows at Sacramento Weir (RM 63) to the Yolo Bypass (USACE, 1999). The American River flows into the Sacramento River at RM 60. Flows from the Yolo Bypass re-enter the river near Rio Vista (RM 14). Between the American River and Yolo Bypass junction, portions of the Sacramento River water are divided among several sloughs.

The capacity of the leveed Sacramento River at various locations is listed in Table 9-2.

Table 9-2
Sacramento River Leveed Capacity

Location	Flow (cfs)
Upstream of Moulton Weir	160,000 cfs
Moulton Weir to Colusa Weir	135,000 cfs
Colusa Weir to Butte Slough Outfall Gates	65,000 cfs
Butte Slough Outfall Gates to Tisdale Weir	66,000 cfs
Tisdale Weir to Freemont Weir	30,000 cfs
Freemont Weir to Sacramento Weir	107,000 cfs
Sacramento Weir to Sutter Slough	110,000 cfs
Sutter Slough to Steamboat Slough	85,000 cfs
Steamboat Slough to Georgiana Slough	56,500 cfs
Georgiana Slough to Yolo Bypass Junction	35,900 cfs
Yolo Bypass Junction to Threemile Slough	579,000 cfs
Threemile Slough to Collinsville	514,000 cfs

Source: DWR, 2009.

9.2.2.4 Feather River (Including Lake Oroville and the Thermalito Complex)

The mainstem of the Feather River is regulated by Oroville Dam, which is part of the SWP and SPFC. The dam was completed in 1968 and forms a 3.5-MAF capacity Lake Oroville. From Lake Oroville, the Feather River flows south through the Sacramento Valley where it is joined by two major tributaries. The Yuba River joins the Feather River at Marysville; the Bear River confluence is approximately 15 miles farther downstream. The Feather River then joins the Sacramento River at RM 80.

Operation of the Oroville facilities varies depending upon hydrology and DWR's objectives. Similar to Shasta, Lake Oroville stores winter and spring runoff for release to the Feather River, as necessary, for project purposes. Typically, releases to the Feather River are managed to conserve water while meeting a variety of water delivery requirements, including flow, temperature, fisheries, diversions, and water quality.

Lake Oroville's flood control storage volume varies from 375 to 750 TAF, depending on hydrologic conditions. Flood management releases are based upon a schedule and diagram prepared by USACE (DWR, 2007). Pursuant to USACE's flood control regulations, the maximum controlled release capacity is 150,000 cfs.

The right bank (looking downstream) of the Feather River is leveed downstream of the Thermalito Afterbay to Honcut Creek. Both banks of the river are leveed downstream of Honcut Creek. These levees and the river are part of the Sacramento River Flood Control Project. The capacity of the leveed Feather River at various locations is listed in Table 9-3.

Table 9-3
Feather River Leveed Capacity

Location	Flow (cfs)
Upstream of Yuba River	210,000
Yuba River to Bear River	300,000
Bear River to Sutter Bypass	320,000

Source: DWR, 2009.

9.2.2.5 American River (Including Folsom Lake and Lake Natoma)

Folsom Lake has a maximum capacity of approximately 1 MAF and is located on the American River approximately 15 miles northeast of the City of Sacramento, near the City of Folsom. Construction of the dam was completed in 1956. It is managed by Reclamation to provide flood control, recreation, power, water supply, Delta water quality protection, and fish flows in the American River and Delta (Reclamation, CCWD, and WAPA, 2009). Lake Natoma is located downstream of Folsom and functions primarily as a regulating reservoir to lessen Folsom releases.

The flood control storage volume of Folsom Lake varies from 400 to 670 TAF. The objective release to the American River is 115,000 cfs (Reclamation, 2008). The American River downstream of Carmichael Bluffs is part of the Sacramento River Flood Control Project. The capacity of the leveed reach upstream of Cal Expo (RM 5) is 115,000 cfs, and downstream to the Sacramento River, the capacity is 180,000 cfs.

9.2.2.6 Sacramento-San Joaquin Delta (Including Suisun, San Pablo, and San Francisco Bays)

The Sacramento-San Joaquin Delta, located to the east of San Francisco Bay, represents the point of discharge for the Sacramento-San Joaquin River system. Water flows out of the Delta, through Suisun and San Pablo bays, into San Francisco Bay, and to the Pacific Ocean, creating an extensive estuary where salty ocean water and fresh river water mix. In sum, water from over 40 percent of the State's land area is discharged into the Delta (Reclamation, CCWD, and WAPA, 2009).

The Delta is a complex system of levees, constructed waterways, and control facilities. The levee system is composed entirely of local levees maintained by local interests (DWR, 2009). These levees were initially constructed to control island flooding during high flow, but because of island subsidence, they now have to prevent inundation during normal runoff and tidal cycles (Reclamation and DWR, 2005). There are approximately 1,100 miles of levees providing protection to 76 islands and tracts. Construction and operation of the CVP and SWP has decreased the frequency of levee failure due to overtopping during flood events (Reclamation and DWR, 2005).

9.2.3 Primary Study Area

The larger streams in the Primary Study Area are Funks Creek, Stone Corral Creek, and the Colusa Basin Drain, which are discussed below. The Colusa Basin Drain is a designated floodway according to the Central Valley Flood Protection Board (CVFPB). The 100-year floodplain delineations for the Primary Study Area, depicting areas subjected to flooding and areas with undetermined flood hazards[1], are shown on Figure 9-4. Areas with undetermined flood hazards include the national wildlife refuges, which are not subject to the FEMA's National Flood Insurance Program regulations.

9.2.3.1 Funks and Stone Corral Creeks

Funks and Stone Corral creeks are ephemeral streams that originate on the westside foothills and are tributary to the Colusa Basin Drain. Snow pack is non-existent due to the low elevation of the watershed. Flood runoff is generated directly from large precipitation events. This area is primarily agricultural with rural farmsteads and small communities. The gentle sloping lands are ideal for rice production and managed wetlands, which also contribute to large areas of inundation during flood events. Road, bridge, railroad, and canal alignments can affect the movement of flood water in this area.

The drainage area of Funks Creek at Funks Dam is 43 square miles. Funks Reservoir is not operated for flood control purposes. There are no stream gages on Funks Creek downstream of Funks Dam because a historical stream gage was washed out and not replaced due to the constantly degrading channel. Peak winter flows of approximately 2,000 cfs are common (TCCA, 2005). Because the topography and soil composition of the watershed are similar to those of Stone Corral Creek, where stream flow records are available, and given the comparable drainage areas of the two watersheds, it is reasonable to assume that the 100-year discharge on Funks Creek is similar to that of Stone Corral Creek.

During a 100-year flood event, Funks Creek overflows its bank downstream of the T-C Canal and Funks Reservoir. Flood waters flow to the north along the creek and to the south where they join with Stone Corral Creek. Stone Corral Creek overflows its bank downstream of the town of Sites. The floodplains of both Funks and Stone Corral creeks are intersected by the GCID Canal, which has levees along each bank.

[1] Neither peak flow nor base flood elevations are available from the FEMA Flood Insurance Study. Instead, areas subject to flooding are depicted.

The drainage area of the Stone Corral Creek watershed is 38.2 square miles at a former gaging station near the town of Sites. Twenty-five years of discharge measurements were collected, with interruption from 1958 through 1985 by the U.S. Geological Survey. During that time, there were three years of zero flow: 1972, 1976, and 1977. A maximum mean daily flow of 2,230 cfs occurred on December 24, 1983. An instantaneous peak flow of 5,700 cfs was recorded on January 26, 1983. The 100-year peak discharge upstream of Sutton Road (aka Cemetery Road), west of Maxwell, is 3,650 cfs, and the 100-year peak discharge downstream of the California Northern Railroad is 3,330 cfs (FEMA, 2003).Flooding in the town of Maxwell occurs directly from Stone Corral Creek and overland flow from Funks Creek. Both I-5 and the Union Pacific Railroad significantly impede the movement of flood flows through Maxwell. Downstream of I-5, Funks and Stone Corral creeks combine and create a single floodplain that moves in a southeasterly direction toward the Colusa Basin Drain.

9.2.3.2 Colusa Basin Drain

Runoff from 11 stream systems draining the foothill and valley floor watersheds contribute flow to the Colusa Basin Drain. This natural historic drainage system for the Colusa Basin has been almost entirely cut off from receiving floodwaters of the Sacramento River by an extensive levee system (except when flood flows on the Sacramento River exceed 300,000 cfs near Ord Ferry). In general, the Colusa Basin Drain conveys flood flows from November through March and agricultural irrigation and drainage flows from April through October. Its northern half is unleveed. Beginning south of Colusa, left bank levees extend southward to its confluence with the Sacramento River. Both Reclamation District 787 and Reclamation District 108 pump drainage from interior lands surrounded by levees to either the Sacramento River or the Colusa Basin Drain.

Both flood and drainage flows are regulated by the Knights Landing Outfall Gates. These gates prevent Sacramento River water from entering the basin. The magnitude of gravity flow from the Colusa Basin Drain is controlled by the water surface elevation in the Sacramento River and the gate openings.

The Knights Landing Ridge Cut provides flood relief to the Colusa Basin Drain by conveying flood and drainage water to the Yolo Bypass if discharge to the river cannot occur. The Knights Landing Ridge Cut design capacity is 20,000 cfs (DWR, 2010). The combined capacity of the Ridge Cut and the Outfall gates are insufficient at times to carry flood flows out of the basin, resulting in backwater conditions and inundation along the drain, especially in its lower reaches. Areas of 100-year flood inundation (Figure 9-4) reflect the limited capacity of the Knights Landing Ridge Cut and the Colusa Basin Drain’s 100-year flood flow at SR 20 of 34,500 cfs (FEMA, 2003). These problems have been the focus of ongoing studies by the Colusa Basin Drainage District to reduce damages to agricultural production.

9.3 Environmental Impacts/Environmental Consequences

9.3.1 Regulatory Setting

Flood hydrology and flood control are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

9.3.1.1 Federal Plans, Policies, and Regulations

- Executive Order 11988 (Floodplain Management)
- Clean Water Act, Section 408

- Federal Emergency Management Agency's National Flood Insurance Program
- Federal Emergency Management Agency Flood Zones and Flood Zone Regulations
- Federal Emergency Management Agency Levee Design and Maintenance Regulations
- Federal Emergency Management Agency 100-year Protection Standard
- Flood Control Act of 1936
- USACE Rehabilitation and Inspection Program
- Operations and Maintenance Controls, Flood Control Projects
- Rivers and Harbors Act of 1899

9.3.1.2 State Plans, Policies, and Regulations

- Central Valley Flood Protection Board Approval
- Assembly Bill 1200
- FloodSAFE California Initiative
- The State Plan of Flood Control Descriptive Document
- Senate Bill 5
- Assembly Bill 162
- California Water Code Section 8609
- California Water Code Division 3: Dams and Reservoirs
- Sacramento-San Joaquin River Basin Comprehensive Study
- Sacramento River Flood Control Project
- Sacramento River Bank Protection Project

9.3.1.3 Regional and Local Plans, Policies, and Regulations

- Colusa County General Plan
- Glenn County General Plan
- Colusa County Code, Chapter 33: Flood Damage Prevention
- Colusa County Flood Control and Conservation District
- Colusa County Floodplain Administrator

9.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for flood control and management:

Would the Project:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows?
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows?
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

9.3.3 Impact Assessment Assumptions and Methodology

9.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to flood control and management:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.

- All dams would be designed to be resistant to various failure modes. Dam safety at both Golden Gate and Sites dams would be monitored by instrumentation, measuring such parameters as seepage, settlement and earthquake-induced accelerations.
- Sites Reservoir would be designed to safely store the Probable Maximum Flood (PMF) without overtopping the dam. For both reservoir size options (i.e., 1.27-MAF and 1.81-MAF) included in the alternatives, the design includes a storage buffer more than 2.5 times larger than required to hold the PMF estimated inflow.
- All three proposed reservoirs (Sites, Holthouse, and TRR) would be designed with emergency spillways to prevent overtopping the dams.
- Sites Reservoir, given its proposed storage capacity, would be designed for a required maximum emergency drawdown release of 23,000 cfs, which would be released through the inlet/outlet works to quickly drain the reservoir, if needed. In addition, the Holthouse Reservoir design would require a spillway sufficient to pass the required Sites Reservoir maximum emergency drawdown release flow of 23,000 cfs.

9.3.3.2 Methodology

The SWP and CVP operations model (water resources simulation model known as CALSIM II) was used to simulate CVP and SWP operations to determine the surface water flows, storages, and deliveries associated with the baseline (i.e., Existing Conditions), No Project/No Action Alternative, and the three action alternatives (Alternatives A, B, and C). A detailed description of the assumptions used for modeling the baselines and the alternatives is included in Appendix 6A. The water resources system models used are described in Appendix 6B. The CALSIM II model was used to simulate system operations for an 82-year period using a monthly time-step. The model included assumptions regarding facilities, land use, water supply contracts, and regulatory requirements for Existing Conditions and the No Project/No Action Alternative. The historical 82-year flow record (1922 to 2003), adjusted for the influences of land use changes and upstream flow regulation, was used to represent the possible range of water supply conditions. Major Central Valley rivers, reservoirs, and CVP/SWP facilities were represented by a network of arcs and nodes. CALSIM II used a mass balance approach to route water through this network. Simulated flows represented mean flows for the month; reservoir storage volumes corresponded to end-of-month storage.

CALSIM II modeled a complex and extensive set of regulatory standards and operations criteria. Descriptions of the modeling assumptions are contained in Appendix 6A. The analysis conducted used the best available tools to approximate systemwide changes in storage, flow, salinity, and reservoir system reoperation associated with the alternatives.

CALSIM II modeling followed all flood control operations rules for existing reservoirs and flood management facilities (i.e., encroachments into the flood control space of existing reservoirs was not allowed). However, CALSIM II's predictive capability is limited and cannot readily be applied to analyzing flood flows and hourly, daily, or weekly time steps for hydrologic conditions. Changes to the extents of the Sacramento River 100-year floodplain cannot be determined fully without operation criteria and model output for hourly, daily, or weekly time steps for hydrologic conditions. CALSIM II uses a monthly time step, which is inappropriate for flood control analysis. Thus, CALSIM II was not used to evaluate changes to the Sacramento River 100-year floodplain.

Of the five large reservoirs in the Secondary Study Area included in the CALSIM II operations modeling, only Shasta, Oroville, and Folsom reservoirs are operated officially with flood control as a primary objective.

9.3.4 Topics Eliminated from Further Analytical Consideration

The proposed Project facilities would all be located in rural and agricultural areas that are not serviced by existing or planned stormwater drainage systems. Therefore, the potential impact to a stormwater drainage system (**Impact Flood-4**) from Project implementation is not relevant to the Project, and is not discussed in this chapter.

In addition, no new housing is proposed as part of the Project. Therefore, potential impacts from placing housing within a flood hazard area (**Impact Flood-5**) from Project implementation is not relevant to the Project, and is not discussed in this chapter.

9.3.5 Impacts Associated with the No Project/No Action Alternative

9.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use, and San Luis Reservoir

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for altering existing drainage patterns, stream courses, or surface runoff has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could result in increased demand for water supplies within the Extended Study Area service areas. Changes in water supply deliveries and the possible associated changes in water elevation fluctuations at San Luis Reservoir would not alter existing drainage patterns and stream courses, or increase surface runoff. A larger population, with the expected increase in urban development, could be expected to alter existing drainage patterns and stream courses, and increase surface runoff. These impacts that would occur as a result of the increased population would be managed at the local level (e.g., cities and counties) in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Refer to the **Impact Flood-1** discussion. That discussion is also applicable to flood flows.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

Refer to the **Impact Flood-1** discussion. That discussion is also applicable to flooding as a result of the failure of a levee or dam.

9.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

Refer to the **Impact Flood-1** discussion for the Extended Study Area. That discussion is also applicable to the Secondary Study Area.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Refer to the **Impact Flood-1** discussion for the Extended Study Area. That discussion is also applicable to the Secondary Study Area.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

If the No Project/No Action Alternative is implemented, current levels of flooding within the Secondary Study Area would not increase, when compared to Existing Conditions. The 100-year flood flows and resulting flood levels within the greater Sacramento River Basin and its associated flood control features would remain unchanged. In turn, the 100-year discharge and inundation areas, as shown on the FEMA floodplain maps, would remain unchanged with the No Project/No Action Alternative.

No Project/No Action Alternative operations modeling results indicate minor changes in Sacramento River basin reservoir levels and flood flows as indicated by end of month storage/water surface elevation and river flow conditions provided in Appendix 6B.

Tables 9-4, 9-5, 9-6, and 9-7 indicate potential impacts to several flood control reservoirs in the Secondary Study Area as a measure of surface water elevation.

Table 9-4
Shasta Lake End of Month Elevation Long-Term Average and Average by Water Year Type for the No Project/No Action Alternative when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	980	979	987	1,001	1,015	1,030	1,041	1,042	1,030	1,008	993	984
No Project/No Action Alternative	980	980	988	1,002	1,015	1,030	1,042	1,042	1,029	1,008	992	984
Difference	0	0	1	0	0	0	0	0	0	0	0	-1
Percent Difference(%)[b]	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Water Year Types[c]												
Wet (32%)												
Existing Condition	1,009	1,004	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,013
No Project/No Action Alternative	1,008	1,003	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,012
Difference	-1	-1	0	0	0	0	0	0	0	-1	0	-2
Percent Difference (%)	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.2
Above Normal (15%)												
Existing Condition	1,006	1,002	1,010	1,011	1,024	1,046	1,062	1,064	1,052	1,030	1,016	1,010
No Project/No Action Alternative	1,004	1,001	1,009	1,010	1,023	1,045	1,062	1,064	1,051	1,030	1,015	1,008
Difference	-2	-1	-1	-1	-1	0	0	0	0	-1	-1	-2
Percent Difference (%)	-0.2	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-5
Trinity Lake End of Month Elevation, Long-Term Average and Average by Water Year Type for the No Project/No Action Alternative when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-6
Lake Oroville End of Month Elevation, Long-Term Average and Average by Water Year Type for the No Project/No Action Alternative when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Full Simulation Period[a]												
Percent Difference (%)[b]	-0.6	-0.5	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1	-0.2	-0.3	-0.4	-0.6
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	-0.9	-0.8	-0.6	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.2	-0.5	-0.9
Above Normal (15%)												
Percent Difference (%)	-0.5	-0.5	-0.5	-0.2	-0.1	-0.1	-0.1	0.0	0.0	-0.2	-0.4	-0.5

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-7
Folsom Lake End of Month Elevation, Long-Term Average and Average by Water Year Type for the No Project/No Action Alternative when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Full Simulation Period[a]												
Percent Difference (%)[b]	-0.4	-0.3	-0.3	-0.2	0.0	0.1	-0.1	-0.1	-0.2	-0.5	-0.5	-0.4
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	-0.2	-0.2	-0.1	0.0	0.1	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.2
Above Normal (15%)												
Percent Difference (%)	-0.5	-0.4	-0.4	-0.1	0.1	0.2	0.0	0.0	-0.2	-0.3	-0.7	-0.4

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-4 shows the average Shasta Lake end of the month water surface elevation for the No Project/No Action Alternative, when compared to Existing Conditions over the long-term and by water year type. The Wet and Above Normal year types are listed in the table because flooding is most likely to occur during these water year types. The long-term average water surface elevation changes would range between -0.1 and 0.1 percent. Changes for Wet and Above Normal years would range between 0.2 and 0.0 percent for both year types.

Tables 9-5, 9-6, and 9-7 indicate similar impacts at Trinity, Oroville, and Folsom reservoirs. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** to flood risks, including potential flooding due to a levee or dam failure, when compared to Existing Conditions.

9.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

Projects considered within the No Project/No Action Alternative are not located within the Primary Study Area. In addition, none of the proposed Project facilities would be constructed if this alternative is implemented. Local hydrology and drainage within the Primary Study Area would, therefore, be expected to remain substantially the same. Implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Refer to the **Impact Flood-1** discussion. That discussion is also applicable to the Primary Study Area.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

Refer to the **Flood-1** discussion. All existing facilities would be subject to current levels of flooding. The 100-year flood flows and resulting levels for Funks and Stone Corral creeks and the Colusa Basin Drain would remain unchanged. The 100-year discharge and inundation as shown on the FEMA floodplain maps would also likely remain unchanged with the No Project/No Action Alternative. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on flood risks, including potential flooding due to a levee or dam failure, when compared to Existing Conditions.

9.3.6 Impacts Associated with Alternative A

9.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use, and San Luis Reservoir

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

There would be no direct Project-related construction or maintenance occurring within the CVP and SWP service areas of the Extended Study Area; therefore, no Project-related flooding would occur, resulting in **no impact** in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

If Alternative A is implemented, changes in SWP and CVP service area water supply deliveries and surface water elevation fluctuations at San Luis Reservoir would not alter existing drainage patterns, stream courses, or surface runoff within the Extended Study Area. Therefore, operation of Alternative A would result in **no impact** on existing drainage patterns, stream courses, or surface runoff within the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

If Alternative A is implemented, no new Project-related structures would be constructed within the Extended Study Area, thus no 100-year flood flows would be impeded or redirected by their placement. Therefore, operation of Alternative A would result in **no impact** on 100-year flood flows within the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

San Luis Reservoir is operated entirely as a joint CVP and SWP supply storage reservoir and is not operated for flood control purposes. If Alternative A is implemented, water level fluctuations that would occur at San Luis Reservoir would fall within the historic range of operation and would not expose people or structures to any additional flooding risks related to dam failure. Thus, operation of Alternative A would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure, within the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

9.3.6.2 Secondary Study Area - Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

If Alternative A is implemented, no direct Project-related construction would occur at any of the above-listed facilities or areas within the Secondary Study Area other than the installation of one additional pump into an existing bay at the Red Bluff Pumping Plant. The additional pump would not alter the existing drainage pattern of the site, alter a stream course, or increase the amount of surface runoff. Therefore, the installation of a pump at the existing Red Bluff Pumping Plant would result in **no impact** on existing drainage patterns, stream courses, or surface runoff within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

If Alternative A is implemented, a new pump at the Red Bluff Pumping Plant would be installed in an existing pump bay. It would not impede or redirect 100-year flood flows. Therefore, construction, operation, and maintenance of Alternative A would result in **no impact** on 100-year flood flows within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

If Alternative A is implemented, the additional pump at the Red Bluff Pumping Plant would be installed in an existing bay and would not modify any existing levees. Therefore, installation of the additional pump would have no effect on existing dams or levees within the Secondary Study Area. When compared to Existing Conditions and the No Project/No Action Alternative, construction, operation and maintenance of Alternative A would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure**.**

Tables 9-8 through 9-15 indicate potential minor operational impacts to several flood control reservoirs in the Secondary Study Area if Alternative A is implemented as a measure of average surface water elevation.

Table 9-8 shows the average Shasta Lake end of the month water surface elevation for Alternative A, when compared to Existing Conditions over the long-term and by water year type. The Wet and Above Normal year types are shown because flooding is most likely to occur during these water year types. Long-term average water surface elevation changes would range between 0.1 and 0.6 percent. Changes during Wet years would range between 0.0 and 0.2 percent, and changes during Above Normal years would range between -0.2 and 0.3 percent.

Table 9-9 shows the same information for Shasta Lake, when compared to the No Project/No Action Alternative. Long-term average water surface elevation changes would range between 0.0 and 0.6 percent. Wet year changes would range between 0.0 and 0.3 percent, and Above Normal year changes would range between -0.1 and 0.5 percent.

Tables 9-10 through 9-15 indicate similar impacts at Trinity, Oroville, and Folsom reservoirs.

As indicated by the water surface elevation data, coordinated operation with Sites Reservoir would not increase flood risks due to significantly higher water surface elevations in flood control reservoirs in the Secondary Study Area during Wet and Above Normal water year types. Therefore, compared to both Existing Conditions and the No Project/No Action Alternative, construction, operation and maintenance of Alternative A would result in a **less-than-significant impact** due to increased flooding risks, including potential flooding due a levee or dam failure, within the Secondary Study Area.

Table 9-8
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Condition	980	979	987	1,001	1,015	1,030	1,041	1,042	1,030	1,008	993	984
Alternative A	985	984	991	1,003	1,015	1,031	1,043	1,045	1,033	1,013	997	989
Difference	5	5	3	2	1	1	2	3	4	4	5	5
Percent Difference (%)[b]	0.5	0.5	0.3	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.5
Water Year Types[c]												
Wet (32%)												
Existing Condition	1,009	1,004	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,013
Alternative A	1,010	1,006	1,011	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,030	1,014

Table 9-8
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Difference	1	2	1	0	0	0	0	0	0	0	1	1
Percent Difference (%)	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Above Normal (15%)												
Existing Condition	1,006	1,002	1,010	1,011	1,024	1,046	1,062	1,064	1,052	1,030	1,016	1,010
Alternative A	1,008	1,004	1,009	1,010	1,022	1,045	1,061	1,064	1,052	1,031	1,018	1,013
Difference	2	2	-1	-1	-2	-1	-1	-1	0	1	2	3
Percent Difference (%)	0.2	0.2	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.2	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-9
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
No Project/No Action Alternative	980	980	988	1,002	1,015	1,030	1,042	1,042	1,029	1,008	992	984
Alternative A	985	984	991	1,003	1,015	1,031	1,043	1,045	1,033	1,013	997	989
Difference	5	5	3	2	0	1	2	3	4	5	5	6
Percent Difference(%)[b]	0.5	0.5	0.3	0.2	0.0	0.1	0.2	0.2	0.4	0.5	0.5	0.6
Water Year Types[c]												
Wet (32%)												
No Project/No Action Alternative	1,008	1,003	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,012
Alternative A	1,010	1,006	1,011	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,030	1,014
Difference	2	3	0	0	0	0	0	0	0	1	1	3
Percent Difference (%)	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
Above Normal (15%)												
No Project/No Action Alternative	1,004	1,001	1,009	1,010	1,023	1,045	1,062	1,064	1,051	1,030	1,015	1,008
Alternative A	1,008	1,004	1,009	1,010	1,022	1,045	1,061	1,064	1,052	1,031	1,018	1,013
Difference	4	4	0	0	-1	0	-1	-1	1	2	3	5
Percent Difference (%)	0.4	0.4	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.1	0.2	0.3	0.5

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-10
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-11
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-12
Lake Oroville End of Month Elevation, Long-term Average, and Average by Water Year Type for Alternative A when Compared to Existing Conditions

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.0	-0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	-0.9	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.6	-1.0
Above Normal (15%)												
Percent Difference (%)	-0.4	-0.5	0.0	0.2	0.2	0.0	0.0	0.0	-0.2	-0.4	-0.4	-0.6

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-13
Lake Oroville End of Month Elevation, Long-term Average, and Average by Water Year Type for Alternative A when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.5	0.5	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.1	0.3	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Above Normal (15%)												
Percent Difference (%)	0.1	0.0	0.5	0.4	0.3	0.0	0.0	0.0	-0.2	-0.2	0.0	-0.1

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-14
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to Existing Conditions

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.2	0.4	0.2	0.2	0.3	0.3	0.1	0.0	0.0	0.4	0.2	0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.3	0.2	0.0	0.1	0.0	0.0	-0.1	-0.1	0.1	0.0	0.5
Above Normal (15%)												
Percent Difference (%)	0.2	0.4	0.1	0.1	0.2	0.2	0.0	0.0	-0.1	0.5	-0.1	0.4

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-15
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative A when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.7	0.7	0.5	0.4	0.3	0.2	0.2	0.1	0.2	0.9	0.7	0.7
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.7
Above Normal (15%)												
Percent Difference (%)	0.7	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.1	0.8	0.6	0.8

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

9.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area and Sites Reservoir Dams

Most reservoirs are designed as "on-stream" reservoirs. On-stream reservoirs are sited to directly dam up an active river channel or in a location where they would receive most of their inflow by capturing natural runoff. By comparison, off-stream reservoirs are not designed to dam up a natural river course and are not sited in a location where they receive the majority of their inflow naturally. Instead, off-stream reservoirs receive their inflow primarily via human-made diversions and are sited in ideal locations where they can store much-needed water for flexible distribution. Examples of California off-stream reservoirs are the SWP-CVP jointly-used San Luis Reservoir, Contra Costa Water District's Los Vaqueros Reservoir, and Metropolitan Water District's Eastside Reservoir (Diamond Valley Lake).

Sites Reservoir is also designed as an off-stream storage facility. Sites Reservoir would receive very little natural runoff from its 83-square mile watershed. Average annual natural inflow into the reservoir would be approximately 15,000 acre-feet which is little more than 1 percent of the Alternative A designed 1.27-MAF reservoir storage capacity. By comparison, the average annual inflow for Lake Oroville is approximately 4.2 MAF, or approximately 120 percent of Lake Oroville's approximately 3.5-MAF storage capacity. Sites Reservoir would be filled predominantly by diversions directly or indirectly from the Sacramento River using existing or new conveyances. Construction of the 1.27-MAF reservoir includes building two main dams and seven saddle dams. The crest elevation of all dams would be 500 feet, providing 20 feet of freeboard above the maximum operating level of 480 feet. The designed emergency spillway elevation would be at 486.5 feet.

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

Flows from Funks and Stone Corral creeks would be impounded and diverted during the construction of Golden Gate and Sites dams. Diversion of Funks and Stone Corral creeks would likely be accomplished by passing storm flows through buried corrugated metal pipe or concrete pipe around the construction areas.

During Project construction, a cofferdam would be installed upstream of the Sites and Golden Gate dams around the dams' construction work areas to retain storm flows entering the reservoir basin from Funks Creek and Stone Corral Creek and thereby keep the dam construction work area dry. These cofferdams would be designed to retain anticipated creek runoff in the reservoir basin during the construction period. During the construction period, storm flows would collect within the proposed reservoir basin behind the cofferdam and be released incrementally through a bypass around the Sites Dam area and discharged downstream. Storm flows would be managed during dam construction so as not to increase the downstream flood potential, resulting in a **less-than-significant impact** when compared to Existing Conditions and the No Project/No Action Alternative. Post-construction, Sites and Golden Gate dams would continue to alter existing flows on Funks and Stone Corral creeks; most water would be released through the reservoir inlet/outlet works. Thus, operation of Sites and Golden Gate dams would result in a **significant impact** due to alteration of a river or stream course, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of Sites Reservoir would decrease the magnitude of the 100-year peak flow event on Funks and Stone Corral creeks downstream of the dams by having the capacity to contain flood flows and control the release of water downstream. With implementation of Alternative A, of the 22,200 acres of land prone to flooding downstream of the proposed Sites and Golden Gate dam locations, approximately 21 percent (4,660 acres) would experience a reduction in flood-related damages. In addition to increasing the level of protection in the Funks Creek and Stone Corral Creek watersheds, a 100-year level of protection would be achieved for approximately 4,025 acres in the Colusa Basin. Based on a 100-year flood event, the flood risk would be reduced for a total of 8,685 acres (Reclamation, 2012). Therefore, operation of Sites Reservoir would result in a **potentially beneficial effect** by reducing the amount and rate of surface water runoff that has historically flooded areas downstream of the dams, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with the reservoir (e.g., law enforcement and garbage removal) and dams (equipment, foundation, and embankment inspections and repairs; debris and vegetation removal) would not alter existing drainage patterns or the course of a stream and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Both Golden Gate and Sites dams would be located within 100-year flood hazard areas associated with Funks and Stone Corral creeks. Neither dam would impede or redirect flood flows in a manner that would increase potential downstream flood impacts. In contrast, both creeks would be impounded and diverted in a controlled manner during the construction of the dams, and operation of the dams would help to alleviate potential downstream flood flows on these creeks by capturing watershed runoff. Therefore, construction and operation of both dams would result in a **potentially beneficial effect** on 100-year flood flows downstream of the dam, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with the dams, including equipment, foundation, and embankment inspections and repairs would not impede or redirect flood flows and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

DWR has prepared a potential dam break inundation map that reflects the inundation scenario associated with the future facility (Figure 9-5). The flood wave that would result from a hypothetical breach of Golden Gate Dam or Sites Dam has a small probability of occurring, but would present a significant hazard to both occupied and non-occupied structures downstream of Sites Reservoir. The peak outflow from a breach of Sites Reservoir is estimated at 2,078,000 cfs. The flood wave would flow east following the natural streambeds and would fan out to the relatively flat terrain of the Sacramento Valley before reaching the City of Maxwell and I-5. The estimated flow velocity at Maxwell and I-5 would be 4.5 feet per second and the maximum depth would be 10 feet. The flood wave would then continue approximately 13 miles east to the City of Colusa and the Sacramento River. The flood wave would then be impeded by the west levee of the Sacramento River. The flood would reach a depth of 22 feet (upslope of the Sacramento River levee) (DWR, 2005).

However, the Sites Reservoir dams would be designed and constructed pursuant to conservative guidelines and criteria designed to prevent failure. The designs would incorporate multiple lines of defense or design redundancy as required to meet both DWR's Division of Safety of Dams (DSOD) and Reclamation design standards. For example, the dam would be designed to withstand the largest and strongest earthquake (Maximum Credible Earthquake) as well as the largest possible flood (Probable Maximum Flood). These design standards would protect the dam from seismic or other catastrophic failure.

In addition, operation of Golden Gate and Sites dams would be monitored by instrumentation measuring such parameters as seepage, settlement, and earthquake-induced accelerations, which could provide early warning signs of potential dam failure. With modern design criteria, construction practices, and post-construction monitoring, the probability of dam failure and subsequent impacts is extremely small. Therefore, Sites Reservoir and Dams would result in a **less-than-significant impact** on the risk of loss, injury, or death due to flooding caused by dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Both DSOD and Reclamation dam safety guidelines establish criteria for handling the emergency evacuation of a reservoir and the design of related facilities, such as the Sites Dam emergency spillway and outlet structure, required to handle the evacuation flows. Although the NODOS Feasibility Study follows DSOD design standards, DSOD's emergency evacuation criteria are actually more conservative than Reclamation's evacuation criteria. Thus, Sites Dam and the associated facilities required to handle the emergency evacuation flows would meet both DSOD and Reclamation standards (Reclamation, 2012; Reclamation, 1990).

Based on DSOD guidelines, Sites Reservoir would include an emergency spillway to release flows with an elevation set to the potential PMF water surface elevation. The proposed emergency spillway design is a simple "morning glory" intake and outflow pipe structure located in Saddle Dam 6, which would allow for overflow spill if the water surface reaches the PMF elevation. However, as an offstream reservoir, Sites Reservoir would be filled by Project-controlled diversions and would receive little inflow from the local creeks. Generally, Sites Reservoir would fill to its highest operating levels by spring to early summer, and then the levels would be drawn down during summer for water supply uses. By the time of the rainy season, when a 100-year flood is generally anticipated, the reservoir would have more than enough capacity to handle large storm events from the local creeks, even at full operating capacity.

In addition, both DSOD and Reclamation require that large reservoirs, such as Sites Reservoir, have facilities capable of allowing rapid emergency drawdown of the water in the reservoir in the event of an unsafe condition at the dam. DSOD emergency drawdown (or "evacuation") guidelines for a large reservoir require that the dam facilities have the capability to lower the reservoir level by an amount equal to 10 percent of the hydraulic head[2] behind the dam in 10 days, and to evacuate the entire reservoir in 120 days. Sites Reservoir would accomplish this drawdown via the outlet tunnel in the inlet/outlet structure, which could discharge emergency release flows directly into Funks Creek; some of this drawdown could be attenuated by Holthouse Reservoir or released via the Delevan Pipeline, the T-C Canal, or the GCID Canal. The currently designed maximum discharge rate is 23,000 cfs, which exceeds the required 10-day average discharge rate. However, the risk of an event requiring such an emergency release remains very small. Because the probability of the emergency release event occurring is so remote, Sites Reservoir and Dams would have a

[2]The hydraulic head is the difference between the normal maximum water surface elevation and the dead pool (i.e., the water level below which water can no longer be discharged) elevation

less-than-significant impact on the risk of loss, injury, or death due to flooding caused by emergency reservoir releases, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The Sites Pumping/Generating Plant, Tunnel, Electrical Switchyard, and Field Office Maintenance Yard would not be located directly on the Funks Creek channel alignment. Therefore, construction activities associated with these facilities would not alter existing drainage patterns or alter the course of Funks Creek. Post-construction, the footprint for these proposed facilities is not expected to substantially alter the existing drainage patterns in that area. In addition, the new impervious areas associated with these facilities would not be large enough to cause a significant increase in surface runoff. Maintenance activities, including washing and cleaning of equipment, inspections, and fence maintenance, would not alter drainage patterns or stream courses. Therefore, construction, operation, and maintenance of these facilities would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Most of the footprint of the Sites Reservoir Inlet/Outlet Structure would not be located directly on the Funks Creek channel alignment. However, the footprint of the outlet approach channel to Holthouse Reservoir would cross the Funks Creek channel and would permanently remove approximately 0.5 mile of Funks Creek immediately upstream of the existing Funks Reservoir. During construction, Funks Creek would be diverted. During operation, Funks Creek would flow into the approach channel upstream of the existing Funks Reservoir. Although slight alteration of the course of the creek would occur, it would not result in flooding because diverted flows would be controlled during construction, and upstream flows would be controlled by releases from Sites Reservoir during operation. Maintenance activities, such as inspections, would not alter drainage patterns or stream courses. Therefore, construction, operation, and maintenance of the inlet/outlet structure would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

The proposed Sites Pumping/Generating Plant, Tunnel, Reservoir Inlet/Outlet Structure, Electrical Switchyard, and Field Office Maintenance Yard would be constructed within the 100-year flood hazard area associated with Funks Creek. However, during construction, the flows from Funks Creek would be controlled with a diversion system. During operation, Sites Reservoir would substantially reduce flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. The maintenance activities would not place structures within a flood hazard area. Therefore, these facilities are not expected to significantly impede or redirect 100-year flood flows. Construction, operation, and maintenance of these facilities would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

No dams or levees are associated with these proposed Project facilities. Therefore, construction, operation, and maintenance of these facilities would result in **no impact** due to increased flood risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The proposed Recreation Areas would encompass a total of approximately 1,205 acres, which is less than two square miles. Assuming the two square miles were completely covered by new impervious surface areas, such as asphalt parking lots, this would still account for only approximately 2 percent of the 83-square-mile Sites Reservoir watershed drainage area, which is too small to cause a significant difference in runoff from the runoff that currently occurs in that area (Reclamation, 2012). Therefore, construction, operation, and maintenance of the proposed Recreation Areas would not substantially alter the existing drainage patterns or a stream or river course, nor substantially increase surface runoff, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

If Alternative A is implemented, the proposed Recreation Areas would not be developed within a 100-year flood hazard area. Therefore, their construction, operation, and maintenance would result in **no impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

If Alternative A is implemented, there would be no dams or levees associated with the proposed Recreation Areas. Therefore, construction, operation, and maintenance of the proposed Recreation Areas would result in **no impact** due to increased flood risks, including potential flooding due to a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

If Alternative A is implemented, construction activities would include the relocation of portions of the existing Maxwell Sites Road and Sites Lodoga Road, and construction of the South Bridge across Sites Reservoir. This road relocation alignment, which includes the new South Bridge crossing, would be paved during construction and maintained as such during operation, but would not add significant new paved road area relative to the existing roadway alignment. In addition, this road relocation alignment would not cross any streams, and therefore, would not alter the course of a stream during construction or operation.

The temporary construction roads and additional permanent access roads, such as those to the proposed recreation areas and Project facilities, would be constructed and operated as unpaved (gravel) roads, and in turn, would not significantly contribute to surface runoff. In addition, these roads would not cross any streams, and therefore, would not alter the course of a stream during construction or operation. The only exception would be the proposed Eastside Road, which would be paved for approximately four miles at its southern end, and would cross Funks Creek approximately 0.4 mile downstream of the proposed Golden Gate Dam. The portion of the road that would be paved during construction and maintained as such during operation would not add significant new paved road area. The Funks Creek crossing would require the installation of a culvert; this activity would occur during the period that the creek is diverted. Although slight alteration of the course of the creek would occur during diversion, it would not result in flooding because bypass flows would be controlled during construction, and the course of the stream would be restored prior to operation. During operation, upstream flows would be controlled by releases from Sites Reservoir.

Road maintenance activities, such as chip sealing, patching, grading, vegetation control, and repair of damaged guardrails or fencing, and minor bridge or culvert maintenance, would consist of debris removal, and would not alter existing drainage patterns or alter the course of a stream. Therefore, construction, operation, and maintenance of the road relocations, new South Bridge, and new access roads combined would not substantially alter existing drainage patterns or stream courses and would not increase surface runoff, resulting in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

If Alternative A is implemented, the northeast end of the proposed Sulphur Gap Road, where it would connect with the existing Maxwell Sites Road, would be constructed within a portion of Stone Corral Creek's 100-year flood hazard area. However, only a small portion of flood hazard area would be affected by the proposed roadway during construction, and during operation, Sites Reservoir would substantially reduce flood flows associated with Stone Corral Creek by capturing runoff from a large portion of the upstream watershed. Road maintenance activities would not place additional structures within the flood hazard area. Therefore, construction, operation, and maintenance of the proposed road would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

If Alternative A is implemented, there would be no dams or levees associated with the proposed Road Relocations and South Bridge. Therefore, the construction, operation, and maintenance of the Road Relocations and the South Bridge would result in **no impact** due to increased flood risks including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The proposed GCID Canal Facilities modifications (including the new headgate structure, 200 feet of canal lining, and railroad siphon replacement) would not drastically alter the existing canal structure. In addition, operation and maintenance activities are expected to be similar to those of the existing canal. Construction, operation, and maintenance activities associated with the GCID Canal Facilities modifications would not alter the course of a natural stream or river and would not substantially alter existing drainage patterns or increase runoff. Therefore, construction, operation, and maintenance of the proposed GCID Canal Facilities modifications would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Most of the existing GCID Canal does not pass through a 100-year flood hazard area except for the north end, which passes through a 100-year flood hazard area associated with primarily Colusa Basin Drain flows. However, the proposed GCID Canal Facilities modifications that would occur during Project construction would be made to the existing canal and thus would not further impede or redirect 100-year flood flows more than the existing canal. In addition, operation and maintenance activities would be similar to those performed at the existing canal. Therefore, construction, operation, and maintenance of the proposed GCID Canal Facilities modifications would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

The existing GCID Canal Facilities are located on a non-leveed bypass channel that diverts Sacramento River flows. Because no levees or dams are associated with the GCID Canal Facilities, construction, operation, and maintenance the proposed modifications would have no impact on levees or dams, and therefore, no associated potential flood risk impacts due to levee or dam failure. Therefore, construction, operation, and maintenance of the proposed GCID Canal Facilities modifications would result in **no impact** due to increased flood risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Preliminary feasibility studies indicate that Holthouse Reservoir would need an active storage of approximately 6,500 acre-feet (approximately three times larger than the existing Funks Reservoir storage), covering a surface area of 530 acres (approximately 2.3 times larger than the existing Funks Reservoir surface area) and with maximum dam embankment heights of 45 feet above existing grade (Reclamation, 2012).

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

Dredging of the existing Funks Reservoir, as well as the construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard, would require the diversion of Funks Creek. Although alteration of the course of the creek would occur, it would not result in flooding because bypass flows would be controlled during construction.

The proposed Funks Reservoir enlargement that would result from construction of the adjacent Holthouse Reservoir would not be a large enough increase to substantially alter drainage patterns around the existing Funks Reservoir. In addition, during operation, the upstream Sites Reservoir would substantially reduce flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. Operation and maintenance activities associated with the enlarged Holthouse Reservoir Complex are expected to be similar to those of the existing Funks Reservoir and would not increase the risk of flooding from existing conditions in the area. Maintenance of the existing Funks Reservoir would include road, vegetation, and fence maintenance, and debris removal. Funks Reservoir is also drained annually. These maintenance activities are expected to be the same for Holthouse Reservoir. Maintenance of the electrical switchyard may include annual washing and cleaning of insulating equipment, and landscape maintenance; these activities would not affect drainage patterns. Therefore, construction, operation, and maintenance of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard, and dredging of the existing Funks Reservoir, would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Funks Reservoir is an existing structure; an evaluation of **Impact Flood-2** is therefore not applicable to that Project feature. The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would be constructed within a Special Flood Hazard Area associated with Funks Creek 100-year flood flows. However, during construction, the flows from Funks Creek would be controlled with a diversion system. During operation, the larger Holthouse Reservoir would likely not impede 100-year flood flows more so than the existing Funks Reservoir, which is located within the same Special Flood Hazard Area. The four-acre Holthouse Reservoir Electrical Switchyard would have a gravel base, and would not be expected to significantly impede 100-year flood flows. In addition, operation of Sites Reservoir would substantially reduce flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. Maintenance activities are expected to be similar to those of the existing Funks Reservoir for Holthouse Reservoir, and would involve washing and vegetation control for the electrical switchyard; these activities would not place additional structures within the Special Flood Hazard Area.

Therefore, construction, operation, and maintenance of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

As designed, the 6,500-acre-foot Holthouse Reservoir, which is an expansion of the existing Funks Reservoir, would be a jurisdictional reservoir[3]. For jurisdictional reservoirs, DSOD oversees the dam design and permitting processes and usually requires a dam break analysis as part of the design and permitting process. The reservoir design is not detailed enough at this stage for a quantitative analysis. However, Holthouse Dam would be designed and constructed pursuant to the same conservative guidelines and criteria designed to prevent failure as described for Sites Reservoir. These design standards would protect the dam from seismic or other failure, and would, therefore, result in a **less-than-significant impact** on the risk of loss, injury, or death due to flooding caused by dam failure, when compared to Existing Conditions and the No Project/No Action Alternative. Holthouse Reservoir would also be constructed with a maximum emergency spillway discharge capacity of 23,000 cfs to pass the equivalent Sites Reservoir emergency drawdown flows required by DSOD, which would be discharged directly into Funks Creek via the inlet/outlet works (Reclamation, 2012). Some of this emergency drawdown could also be attenuated by the TRR, or could be released via the Delevan Pipeline, the T-C Canal, or the GCID Canal. However, the risk of an event requiring such an emergency release remains very small. Because the probability of the emergency release event occurring is so remote, the Holthouse Reservoir Complex would have a **less-than-significant impact** on the risk of loss, injury, or death due to flooding caused by emergency reservoir releases, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with Holthouse Reservoir are expected to be similar to those of the existing Funks Reservoir and would not be expected to exposed people to increased flood risks. Therefore, maintenance of the Holthouse Reservoir Complex would result in a **less-than-significant impact** on the exposure of people to increased flood risks, including potential flooding due to a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pipeline, and Terminal Regulating Reservoir Pipeline Road

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The portion of these TRR facilities that would be constructed and operated above ground would not be located near a stream and do not have a large enough footprint to substantially alter existing drainage patterns. In addition, operation of the upstream Sites Reservoir would substantially reduce flood flows in this area associated with Funks Creek by capturing runoff from a large portion of the upstream watershed, as well as by limiting post-construction flows to Funks Creek downstream of Golden Gate Dam.

Maintenance activities, such as vegetation clearing and necessary repairs to the TRR Pipeline Road, would not substantially affect runoff in the area. However, the draining and dredging of the reservoir,

[3] A Jurisdictional Reservoir is a reservoir for which DSOD has design and construction permitting jurisdiction. A main threshold for DSOD jurisdiction is a minimum six foot height requirement.

which would occur every seven to 10 years depending on sediment accumulation, would require releases from the reservoir to Funks Creek via the TRR to Funks Creek Pipeline. Although these releases would increase creek flows, releases would be controlled with an energy dissipater and small concrete structure at the terminal end of the pipeline to avoid exceeding the capacity of the creek channel. Therefore, construction, operation, and maintenance of these TRR facilities would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

The TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, and TRR Pipeline Road would be constructed and operated within a 100-year flood hazard area associated with Funks Creek. These above-ground structures may impede 100-year flood flows; however, Sites Reservoir would substantially reduce these 100-year flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. Maintenance activities associated with these facilities would not place additional structures within the flood hazard area. Therefore, construction, operation and maintenance of these TRR facilities would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

The TRR Pipeline and TRR to Funks Creek Pipeline would both be constructed within a 100-year flood hazard area associated with Funks Creek. Both pipelines would be buried a minimum of 10 feet (to top of pipe) below the ground surface. The only above-ground features associated with both pipelines would be blow off and air valves, each of which would occupy a small area of land. Once installed, surface grading would be restored above the pipelines such that operation of these pipelines would not significantly impede or redirect flood flows or increase flooding hazards in other areas. The pipelines would thus not impede 100-year flood flows. Therefore, construction, operation and maintenance of the TRR Pipeline and the TRR to Funks Creek Pipeline would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

Because of safety factors that are built into current engineering design practices, the probability of dam failure, in general, is extremely small. The TRR is expected to be considered jurisdictional by DSOD because the preliminary designed embankment height would be greater than six feet. A dam break analysis has not yet been performed, but the TRR would be designed and constructed pursuant to the same conservative guidelines and criteria designed to prevent failure as described for Sites Reservoir. These design standards would protect the dam from seismic or other failure, and would, therefore, result in a **less-than-significant impact** on the risk of loss, injury, or death due to flooding caused by dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Reservoir design would allow emergency releases during operation first to the GCID Canal, and then to Funks Creek via the TRR to Funks Creek Pipeline. Although these releases would increase creek flows, releases would be controlled with an energy dissipater and small concrete structure at the terminal end of the pipeline to avoid exceeding the capacity of the creek channel. In addition, the risk of an event requiring such an emergency release remains very small. Therefore, the TRR facilities would result in a

less-than-significant impact on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The Delevan Transmission Line would be operated as an entirely above-ground Project facility, except for its tower footings. Construction of the required footings for the 13-mile-long transmission line would create a total permanent ground disturbance of approximately 2.5 acres. However, given that the footings would not be a continuous strip of concrete (i.e., they would be spaced apart), this land area disturbance would not significantly alter the existing drainage area or runoff patterns of the transmission alignment area. In addition, tower footings would be sited to avoid stream crossings, and therefore, would not alter the course of a stream. Maintenance activities, including equipment inspections and vegetation maintenance, would not alter drainage patterns or alter the course of a stream. Therefore, construction, operation, and maintenance of the Delevan Transmission Line would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

Approximately half of the length of the above-ground Delevan Transmission Line would be located within the northern portion of a designated 100-year flood hazard area associated with primarily Colusa Basin Drain flows. Although the transmission line would be operated as an entirely above-ground facility, the construction of the required transmission line footings for the entire 13-mile length of the transmission line would create a total ground disturbance of approximately 2.5 acres. Approximately half of these footings would be located within a flood hazard area. However, the footings would be spaced apart, and their individual small footprint would not significantly impede 100-year flood flows. Maintenance activities would not place additional structures within the flood hazard area. Therefore, construction, operation, and maintenance of the Delevan Transmission Line would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

No dams or levees are associated with the Delevan Transmission Line. Therefore, construction, operation, and maintenance of the Delevan Transmission Line would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Electrical Switchyard

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The Delevan Pipeline Electrical Switchyard would not be located directly on the Funks Creek channel alignment. Therefore, construction activities would not alter existing drainage patterns or alter the course of Funks Creek. During operation, the four-acre ground surface of the switchyard would have a gravel base and would not be expected to significantly alter the existing drainage area or runoff patterns of that area. Maintenance activities, including equipment washing and vegetation maintenance, would not alter drainage patterns or alter the course of a stream. Therefore, construction, operation, and maintenance of the Delevan Pipeline Electrical Switchyard would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

The Delevan Pipeline Electrical Switchyard would be constructed within a designated 100-year flood hazard area associated with Funks Creek. However, during construction, the flows from Funks Creek would be controlled with a diversion system. During operation, the four-acre switchyard would have a gravel base, and would not be expected to significantly impede 100-year flood flows. In addition, operation of Sites Reservoir would substantially reduce flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. Maintenance activities would not place additional structures within the flood hazard area. Therefore, construction, operation, and maintenance of the Delevan Pipeline Electrical Switchyard would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

No dams or levees are associated with the Delevan Pipeline Electrical Switchyard. Therefore, construction, operation, and maintenance of the Delevan Pipeline Electrical Switchyard would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The Delevan Pipeline would be constructed as an underground facility, generally buried 10 feet below the ground surface. The pipeline would cross the Colusa Basin Drain at the northern end of the drain. Construction at this crossing would likely occur during late fall after the irrigation season ends and before winter rains begin. Despite the timing, a portion of the CBD would likely need to be dewatered, with any existing flows bypassed around the construction site. This construction at the crossing would be accomplished by installing the pipeline in stages and bypassing flows on one side of the channel following the construction of a cofferdam. The slight alteration of the course of this waterway would not substantially alter drainage patterns. After installation of the pipeline, the CBD would be returned to a full channel and would be reconstructed to pre-project conditions. Once installed, surface grading would be restored above the pipeline such that it would not significantly alter the existing area drainage pattern. The only above-ground components associated with the operation of the Delevan Pipeline would be manholes and blow off and air valves, each of which would occupy a small area of land, and would, therefore, not impede or redirect flood flows. Maintenance activities, including periodic inspections, would not affect drainage patterns or runoff. Therefore, construction, operation, and maintenance of the Delevan Pipeline would result in a less-than-significant impact on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

The Delevan Pipeline would cross the northern portion of a designated 100-year flood hazard area associated with Funks Creek and Colusa Basin Drain flows. However, the Delevan Pipeline would be constructed as an underground facility, and therefore, would not impede or redirect flows.

Once the pipeline is installed, surface grading would be restored above the pipeline such that it would not significantly impede or redirect flood flows or increase flooding hazards in other areas. The only above-ground components associated with operation of the Delevan Pipeline would be manholes and blow off and air valves, each of which would occupy a small area of land. These above-ground components would not impede 100-year flood flows. In addition, Sites Reservoir would substantially reduce flood flows associated with Funks Creek by capturing runoff from a large portion of the upstream watershed. Maintenance activities would not place additional structures within the flood hazard area. Therefore, construction, operation, and maintenance of the Delevan Pipeline would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

No dams or levees are associated with the Delevan Pipeline. Therefore, construction, operation, and maintenance of the Delevan Pipeline would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

The proposed Delevan Pipeline Intake Facilities would be constructed adjacent to the Sacramento River, where an existing flood protection levee separates the river from upland areas. The proposed footprint would not cover an area large enough to substantially alter existing drainage patterns or increase surface runoff. During construction and operation, the facility would be surrounded by a wide berm or ring levee that would have impacts on drainage patterns and surface runoff similar to those of the existing levee, and therefore, would not increase the risk of flooding. The proposed intake would require the construction of a large fish screen, which would be located on the west side of the river channel immediately downstream of the Maxwell ID Pumping Plant. During construction, a sheet-pile cofferdam that would extend approximately 40 feet into the river channel would be required to allow dewatering of the construction area. The cofferdam would be removed when construction is complete, but the operating fish screen would continue to extend into the river channel. In-channel structures have the potential to alter the course of the river. However, the preliminary fish screen was designed so as to not protrude into the river channel in a manner that would substantially alter the river channel. In addition, the upstream Maxwell ID Pumping Plant is located in a narrow section of the river and consequently acts as a local flow control point (Reclamation, 2012). Maintenance of the facilities would not alter drainage patterns or affect surface runoff.

Therefore, construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

The Delevan Pipeline Intake Facilities would be located adjacent to the Sacramento River within an area protected from the 100-year flood by existing levees along the Sacramento River. The Project includes improvements to the levee in the area of the intake to enhance the flood protection for this facility. An earthen setback levee (or ring levee around the site) would be installed for protection during construction and would remain a permanent structure to provide secondary containment of the Sacramento River in the event of a flood in the area. These above-ground structures would not impede 100-year flood flows during operation.

In addition, preliminary analysis shows that the proposed fish screen would not substantially impact the water surface elevation at high flows. Water surface elevations with the proposed fish screen are not expected to be significantly different than without the fish screen. The existing Maxwell ID Pumping Plant upstream from the proposed intake location would be the controlling structure, causing greater changes on Sacramento River water surface elevations at high flows than the proposed Delevan Pipeline Intake Facilities (Reclamation, 2012). Maintenance activities would not place additional structures within a flood hazard area. Therefore, construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would result in a **less-than-significant impact** on 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

Construction of the Delevan Pipeline Intake Facilities would require modification of the existing flood protection levee along the Sacramento River. Construction work along the existing levee has the potential to destabilize adjacent levee segments and, under worst-case conditions, cause their failure. DWR's and Reclamation's construction contractor would use standard geotechnical engineering practices related to the stabilization and compaction of soils during and after work around the levee for the Delevan Pipeline Intake Facilities to ensure that the integrity of the levee is not compromised. Such practices include soil densification of foundation soils to improve their stabilization and reduce potential liquefaction. Construction plans, specifications, and inspections would be coordinated with the CVFPB, as appropriate. It is unlikely that these facilities would significantly change the degree of protection of people and property behind the levee or result in an increased risk of levee failure.

Operation of the intake facilities would require the construction and operation of a forebay and afterbay. The forebay would be located on the river side of the existing Sacramento River levee, and would pass water to the concrete-lined afterbay through levee tubes that would pass under the existing levee. A new berm or ring levee would be constructed to enclose the afterbay. The remaining facilities would be constructed and operated on top of the berm. During extreme flood events on the river, the forebay and afterbay would be inundated, but these facilities and the levees would be designed to withstand these conditions. Maintenance activities would include the removal of sediment from the afterbay sediment spoil area. Sediment would be removed using a long arm excavator and suction dredge from within the afterbay and would not affect the levees. Therefore, construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would result in a **less-than-significant impact** due to increased flooding risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact Flood-1: Substantially alter the Existing Drainage Pattern of the Site or Project Area, Including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner which would Result in Flooding On- or Off-site

If Alternative A is implemented, construction-related activities within the Project Buffer would include fence construction, demolition of several existing structures, and the creation of a fuelbreak. Ground disturbance associated with fence construction would consist of digging post holes. The existing structures to be demolished within the Project Buffer would include residences, sheds, shops, and barns. A fuelbreak would be created around the perimeter of the buffer. Fence construction, structure demolition, and the creation of a fuelbreak would not alter the course of a stream, and would not increase the rate of runoff in a manner that would result in flooding because the footprint of the fence posts and structures, as well as the area of the fuelbreak, represent a fraction of the acreage included in the Project Buffer. Therefore, construction activities within the Project Buffer would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff within the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Post-construction, Project operations and maintenance activities for the new fence and the fuelbreak within the Project Buffer would result in a **less-than-significant impact** on existing drainage patterns, stream courses, or surface runoff, when compared to Existing Conditions and the No Project/No Action Alternative, because the land would be managed as undeveloped open space that would buffer Project facilities from surrounding land uses.

Impact Flood-2: Place within a 100-year Flood Hazard Area Structures which Could Impede or Redirect Flood Flows

If Alternative A is implemented, the only new structures that would be installed within the Project Buffer would be fence posts. Fence construction, or the presence of the fence posts during operation, would not impede or redirect flood flows because the footprint of the fence posts represents a fraction of the acreage included in the Project Buffer. Maintenance activities would not place additional structures within the Project Buffer. Therefore, construction, operation, and maintenance of the Proposed Take Line would result in **no impact** to 100-year flood flows, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee* o*r Dam

If Alternative A is implemented, no dams or levees would be needed for the land acquisition or demarcation of the Project Buffer, and the Project Buffer would have no effect on an existing levee or dam. Therefore, construction, operation, and maintenance of the Project Buffer would result in **no impact** due to increased flooding risks, including potential flooding due a levee or dam failure, when compared to Existing Conditions and the No Project/No Action Alternative.

9.3.7 Impacts Associated with Alternative B

9.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to drainage patterns, stream courses, or surface runoff (**Impact Flood-1)**, 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3**), would be the same as described for Alternative A for the Extended Study Area.

9.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

Impacts due to the construction, operation, and maintenance of Alternative B, as they relate to drainage patterns, stream courses, or surface runoff (**Impact Flood-1)** and 100-year flood flows (**Impact Flood-2**) within the Secondary Study Area, would be the same as described for Alternative A. However, operational changes resulting from coordination with a 1.81-MAF Sites Reservoir with two conveyances for Alternative B, as opposed to the 1.27-MAF Sites Reservoir with three conveyances for Alternative A, have the potential to impact flood control reservoirs in the Secondary Study Area. The difference in average end of month elevation at the Secondary Study Area flood control reservoirs is described below.

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

Impacts due to the construction and maintenance of Alternative B due to increased flooding risks within the Secondary Study Area would be similar to those described for Alternative A.

Tables 9-16 through 9-23 indicate potential minor operational impacts to several flood control reservoirs in the Secondary Study Area. Table 9-16 provides the average Shasta Lake end of the month water surface elevation for Alternative B when compared to Existing Conditions over the long-term and by water year type. The Above Normal and Wet year types are shown because flooding is most likely to occur during these water year types. Long-term average changes to the water surface elevation would range from a 0.0 to 0.5 percent increase. Changes expected for Above Normal and Wet years would be less, at -0.1 to 0.1 percent and -0.2 to 0.1 percent, respectively.

Table 9-16
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Conditions	980	979	987	1,001	1,015	1,030	1,041	1,042	1,030	1,008	993	984
Alternative B	985	984	991	1,003	1,015	1,031	1,044	1,046	1,034	1,014	998	990
Difference	5	5	3	2	0	1	2	3	4	5	5	5
Percent Difference (%)[b]	0.5	0.5	0.3	0.2	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.5
Water Year Types[c]												
Wet (32%)												
Existing Conditions	1,009	1,004	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,013
Alternative B	1,009	1,005	1,010	1,024	1,033	1,042	1,059	1,065	1,058	1,042	1,029	1,014
Difference	0	1	-1	0	-1	0	0	0	0	0	0	0
Percent Difference (%)	0.0	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Existing Conditions	1,006	1,002	1,010	1,011	1,024	1,046	1,062	1,064	1,052	1,030	1,016	1,010
Alternative B	1,007	1,003	1,008	1,010	1,022	1,045	1,062	1,064	1,053	1,031	1,017	1,011
Difference	1	1	-2	-1	-2	-1	0	0	1	1	1	1
Percent Difference (%)	0.1	0.1	-0.2	-0.1	-0.2	-0.1	0.0	0.0	0.1	0.1	0.1	0.1

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-17 shows the same Shasta Lake information for Alternative B, when compared to the No Project/No Action Alternative. Long-term average changes would range from 0.0 to 0.5 percent increases. Wet year changes would range from -0.1 to 0.1 percent, and Above Normal year changes would range from -0.2 to 0.1 percent.

Modeling results indicate similar impacts at Trinity, Oroville, and Folsom reservoirs (Tables 9-18 through 9-23). Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, construction, operation and maintenance of Alternative B would result in a **less-than-significant impact** due to increased flooding risks, including potential flooding due a levee or dam failure.

Table 9-17
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
No Project/No Action Alternative	980	980	988	1,002	1,015	1,030	1,042	1,042	1,029	1,008	992	984
Alternative B	985	984	991	1,003	1,015	1,031	1,044	1,046	1,034	1,014	998	990
Difference	5	5	3	2	0	1	2	3	4	5	5	6

Table 9-17
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Percent Difference (%)[b]	0.6	0.5	0.3	0.2	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.6
Water Year Types[c]												
Wet (32%)												
No Project/No Action Alternative	1,008	1,003	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,012
Alternative B	1,009	1,005	1,010	1,024	1,033	1,042	1,059	1,065	1,058	1,042	1,029	1,014
Difference	1	1	-1	0	-1	0	0	0	0	0	1	2
Percent Difference (%)	0.1	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Above Normal (15%)												
No Project/No Action Alternative	1,004	1,001	1,009	1,010	1,023	1,045	1,062	1,064	1,051	1,030	1,015	1,008
Alternative B	1,007	1,003	1,008	1,010	1,022	1,045	1,062	1,064	1,053	1,031	1,017	1,011
Difference	3	2	-1	0	-2	0	0	0	1	2	2	3
Percent Difference (%)	0.3	0.2	-0.1	0.0	-0.2	0.0	0.0	0.0	0.1	0.1	0.2	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-18
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to Existing Conditions

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-19
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-20
Lake Oroville End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to Existing Conditions

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	-0.2	-0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.1	-0.4
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	-0.9	-0.8	-0.3	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.6	-1.1
Above Normal (15%)												
Percent Difference (%)	-0.7	-0.8	-0.3	0.1	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.6	-0.9

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-21
Lake Oroville End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.4	0.4	0.5	0.4	0.4	0.3	0.3	0.4	0.4	0.6	0.5	0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
Above Normal (15%)												
Percent Difference (%)	-0.3	-0.3	0.2	0.3	0.2	0.1	0.1	0.0	-0.2	-0.2	-0.1	-0.4

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-22
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to Existing Conditions

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.1	0.2	0.1	0.1	0.2	0.2	0.0	-0.1	-0.1	0.1	0.0	0.4
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.2	0.4
Above Normal (15%)												
Percent Difference (%)	0.0	0.1	-0.1	0.0	0.1	0.2	0.0	0.0	-0.2	-0.1	-0.5	0.0

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-23
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative B when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.6	0.6	0.4	0.2	0.2	0.1	0.1	0.0	0.1	0.6	0.5	0.8
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.6
Above Normal (15%)												
Percent Difference (%)	0.5	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.4

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

9.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to flood control and management:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex

- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The proposed 1.81-MAF Sites Reservoir associated with implementation of Alternative B would require the construction of two main dams and nine saddle dams. The crest elevation of all dams would be 540 feet, providing 20 feet of freeboard above the maximum operating elevation of 520 feet. The emergency spillway elevation would be at 525.5 feet. The larger reservoir would be constructed pursuant to the same conservative guidelines and criteria designed to prevent failure as described for Alternative A. The larger Alternative B reservoir and associated dams would capture flood flows on Funks and Stone Corral creeks and control downstream releases to these creeks as described for Alternative A, and therefore, would have the same impacts on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3**) as described for Alternative A.

The additional saddle dams associated with implementation of Alternative B would require additional saddle dam access roads. However, the slight extension of the saddle dam access roads would result in the same impacts on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3**) as described for Alternative A.

If Alternative B is implemented, the proposed Delevan Transmission Line would extend from only the Inlet/Outlet Structure to the existing PG&E or WAPA transmission line and consequently would not cross the Special Flood Hazard Area. The shorter transmission line would require fewer concrete footings, thus creating a smaller land disturbance footprint than the Alternative A transmission line configuration. These reduced effects would result in the same level of significance of impacts to drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3**) as was described for Alternative A.

The Delevan Pipeline Intake Facilities would be replaced with the smaller Delevan Pipeline Discharge Facility, which would not extend into the river channel, and therefore, would not alter the course of a stream. The Discharge Facility would require similar levee modifications as the Intake Facilities. The smaller footprint would have similar impacts on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** as was described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** as was described for Alternative A.

9.3.8 Impacts Associated with Alternative C

9.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impact of Alternative C on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** would be the same as described for Alternative A for the Extended Study Area.

9.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impact of Alternative C on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**) and 100-year flood flows (**Impact Flood-2**) within the Secondary Study Area would be the same as described for Alternative A. However, operational changes resulting from coordination with a 1.81-MAF Sites Reservoir with three conveyances for Alternative C, as opposed to the 1.27-MAF Sites Reservoir with three conveyances for Alternative A, have the potential to impact flood control reservoirs in the Secondary Study Area. The difference in average end of month elevation at the Secondary Study Area flood control reservoirs is described below.

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact Flood-3: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Flooding, Including Flooding as a Result of the Failure of a Levee or Dam

The impacts due to construction and maintenance of Alternative C within the Secondary Study Area would be similar to those described for Alternative B.

Tables 9-24 through 9-31 indicate potential minor operational impacts to several flood control reservoirs in the Secondary Study Area. Table 9-24 provides the average Shasta Lake end of the month water surface elevation for Alternative C, when compared to Existing Conditions over the long-term and by water year type. The Above Normal and Wet year types are shown because flooding is most likely to occur during these water year types. Long-term average changes to the water surface elevation in Shasta Lake would range from a 0.1 to 0.6 percent increase. Changes in Above Normal and Wet years would be even less, at -0.1 to 0.1 percent and -0.1 to 0.3 percent, respectively.

Table 9-24
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Existing Conditions	980	979	987	1,001	1,015	1,030	1,041	1,042	1,030	1,008	993	984
Alternative C	986	985	992	1,004	1,016	1,032	1,044	1,046	1,034	1,014	998	990

Table 9-24
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to Existing Conditions

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Difference	6	6	4	3	1	2	3	3	5	5	5	6
Percent Difference (%)[b]	0.6	0.6	0.4	0.3	0.1	0.2	0.2	0.3	0.5	0.5	0.5	0.6
Water Year Types[c]												
Wet (32%)												
Existing Conditions	1,009	1,004	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,013
Alternative C	1,010	1,005	1,009	1,024	1,033	1,042	1,059	1,064	1,057	1,043	1,030	1,014
Difference	1	1	-1	0	0	0	0	0	0	0	1	1
Percent Difference (%)	0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Above Normal (15%)												
Existing Conditions	1,006	1,002	1,010	1,011	1,024	1,046	1,062	1,064	1,052	1,030	1,016	1,010
Alternative C	1,008	1,004	1,008	1,012	1,023	1,046	1,062	1,064	1,053	1,031	1,018	1,013
Difference	3	1	-1	1	-1	0	0	0	1	1	2	3
Percent Difference (%)	0.2	0.1	-0.1	0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-25 shows the same Shasta Lake information for Alternative C, when compared to the No Project/No Action Alternative. Long-term average changes would range from 0.1 to 0.6 percent. Wet year changes would range from -0.1 to 0.1 percent, and Above Normal year changes would range from -0.1 to 0.3 percent.

Modeling results indicate similar impacts at Trinity, Oroville, and Folsom reservoirs (Tables 9-26 through 9-31).

Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, construction, operation and maintenance of Alternative C would result in a **less–than-significant impact** due to increased flooding risks, including potential flooding due a levee or dam failure.

Table 9-25
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
No Project/No Action Alternative	980	980	988	1,002	1,015	1,030	1,042	1,042	1,029	1,008	992	984
Alternative C	986	985	992	1,004	1,016	1,032	1,044	1,046	1,034	1,014	998	990
Difference	6	6	4	3	1	2	2	3	5	6	6	6

Table 9-25
Shasta Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to the No Project/No Action Alternative

Analysis Period	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Percent Difference (%)[b]	0.6	0.6	0.4	0.3	0.1	0.2	0.2	0.3	0.5	0.6	0.6	0.7
Water Year Types[c]												
Wet (32%)												
No Project/No Action Alternative	1,008	1,003	1,010	1,024	1,033	1,042	1,059	1,064	1,057	1,042	1,029	1,012
Alternative C	1,010	1,005	1,009	1,024	1,033	1,042	1,059	1,064	1,057	1,043	1,030	1,014
Difference	2	1	-1	0	-1	0	0	0	0	1	1	3
Percent Difference (%)	0.2	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Above Normal (15%)												
No Project/No Action Alternative	1,004	1,001	1,009	1,010	1,023	1,045	1,062	1,064	1,051	1,030	1,015	1,008
Alternative C	1,008	1,004	1,008	1,012	1,023	1,046	1,062	1,064	1,053	1,031	1,018	1,013
Difference	4	3	0	2	0	0	0	0	1	2	3	5
Percent Difference (%)	0.4	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5
Below Normal (17%)												
No Project/No Action Alternative	999	1,002	1,006	1,000	1,017	1,034	1,049	1,050	1,038	1,017	1,002	999
Alternative C	1,000	1,003	1,005	1,001	1,016	1,034	1,049	1,051	1,040	1,018	1,005	1,002
Difference	2	1	-1	0	-1	0	0	0	2	1	3	2
Percent Difference (%)	0.2	0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.2	0.1	0.3	0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-26
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to Existing Conditions

Analysis Period and Water Year Types	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.2	0.3	0.3	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-27
Trinity Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal (15%)												
Percent Difference (%)	0.3	0.3	0.3	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-28
Lake Oroville End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to Existing Conditions

Analysis Period and Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Full Simulation Period[a]												
Percent Difference (%)[b]	-0.2	-0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.0	0.1	0.0	-0.4
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	-0.8	-0.7	-0.1	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.3	-0.6	-1.0
Above Normal (15%)												
Percent Difference (%)	-0.5	-0.5	0.0	0.2	0.1	0.0	0.0	0.0	-0.3	-0.4	-0.4	-0.7

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-29
Lake Oroville End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to the No Project/No Action Alternative

Average Type	End of Month Elevation (Feet)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.4	0.4	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.2
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.2	0.5	0.2	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Above Normal (15%)												
Percent Difference (%)	0.0	-0.1	0.5	0.4	0.2	0.0	0.0	0.0	-0.2	-0.2	0.0	-0.2

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-30
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to Existing Conditions

Analysis Period and Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Full Simulation Period[a]												
Percent Difference (%)[b]	0.3	0.3	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.3	0.3	0.4
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.1	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	0.2	0.0	0.6
Above Normal (15%)												
Percent Difference (%)	0.2	0.2	-0.1	0.0	0.2	0.2	0.0	0.0	-0.1	0.1	-0.2	0.4

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

Table 9-31
Folsom Lake End of Month Elevation, Long-Term Average, and Average by Water Year Type for Alternative C when Compared to the No Project/No Action Alternative

	End of Month Elevation (Feet)											
Average Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-Term												
Full Simulation Period[a]												
Percent Difference (%)[b]	0.7	0.6	0.4	0.3	0.3	0.2	0.1	0.1	0.2	0.7	0.8	0.9
Water Year Types[c]												
Wet (32%)												
Percent Difference (%)	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.8
Above Normal (15%)												
Percent Difference (%)	0.7	0.6	0.3	0.1	0.1	0.0	0.0	0.0	0.1	0.4	0.5	0.8

[a]Based on the 82-year simulation period.
[b]Relative difference of the monthly average.
[c]As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB, 1999).

9.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to flood control and management:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR

- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Areas, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** as described for Alternative B.

The boundary of the Project Buffer would be the same for all alternatives, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on drainage patterns, stream courses, or surface runoff (**Impact Flood-1**), 100-year flood flows (**Impact Flood-2**), and flooding risks (**Impact Flood-3)** as described for Alternative A.

9.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 9-32 for the impacts that have been identified as significant or potentially significant.

Table 9-32
Summary of Mitigation Measures for
NODOS Project Impacts to Flood Control and Management

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Flood-1: Substantially Alter the Existing Drainage Pattern of the Site or Project Area, Including Through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner Which Would Result in Flooding On- or Off-site	Sites Reservoir, Sites Dams	Significant	Mitigation Measure Flood-1: Maintain Permanent Low Flow Releases into Stone Corral and Funks Creeks Downstream of Sites and Golden Gate Dams	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Flood-1: Maintain Permanent Low Flow Releases into Stone Corral and Funks Creeks Downstream of Sites and Golden Gate Dams

To mitigate for **Impact Flood-1** and pursuant to DFG Code 5937 related to maintaining flows downstream of dams, post-construction fish flows into Funks and Stone Corral creeks shall be maintained by DWR and Reclamation by means of low-flow release valves at Golden Gate and Sites dams. Flows shall be maintained at 10 cfs from October through May in both creeks to mimic the seasonal nature of the creeks while avoiding historic flooding.

Implementation of **Mitigation Measure Flood-1** would reduce the level of significance of Project impacts to flood control and management to **less than significant**.

9.5 References

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U.S. Bureau of Reclamation and California Department of Water Resources (Reclamation and DWR). 2005. South Delta Improvement Program.

Figures

Facilities

- **Approximately 1,600 miles of levees**
- **Five major weirs spilling floodwaters from the Sacramento River to bypass channels**
- **Five control structures directing flow in bypass channels along the San Joaquin River**
- **Six major pumping plants**
- **Channel improvements**
- **Bank protection**
- **Associated facilities, such as stream gages and drainage facilities**

Lands

- Fee title, easements, and agreements for project works and mitigation areas
- Approximately 18,000 parcels

Operations and Maintenance

- Two standard O&M manuals
- 118 unit-specific manuals
- Maintenance by State and local maintaining agencies

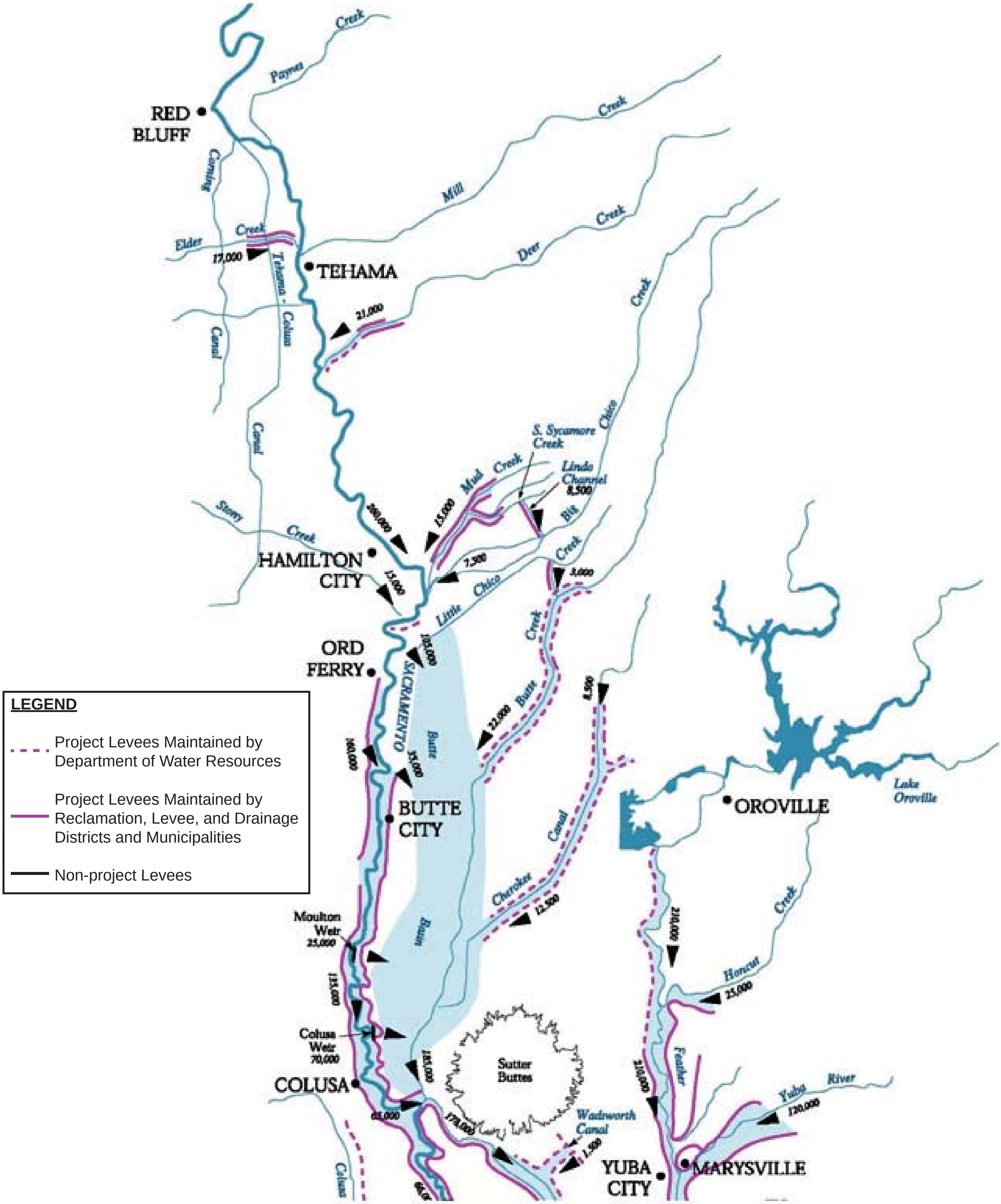
Conditions (terms)

- Assurances
- Flood Control Regulations, Part 208.10 of 33, Code of Federal Regulations
- Requirements of standard and unit-specific O&M manuals
- Design profiles (1955 and 1957)
- Project Cooperation Agreements

Programs and Plans

- Historical documents and processes
- As-constructed drawings
- Oversight and management

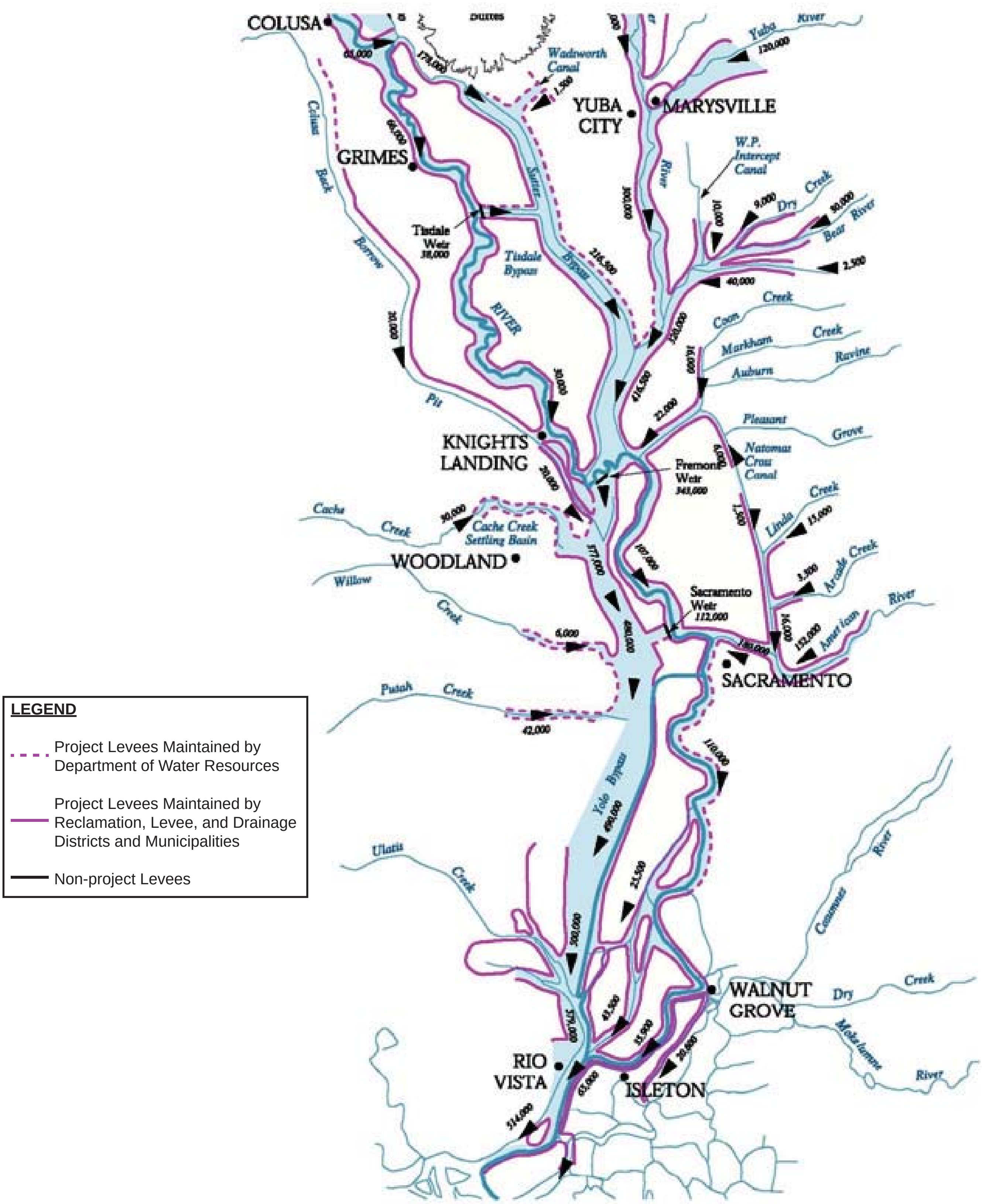
FIGURE 9-1
Overview of SPFC Project Works
North-of-the Delta Offstream Storage Project



Source: Modified from Department of Water Resources, Division of Flood Management, November 2003 Sacramento Valley Flood Control System Map.

N

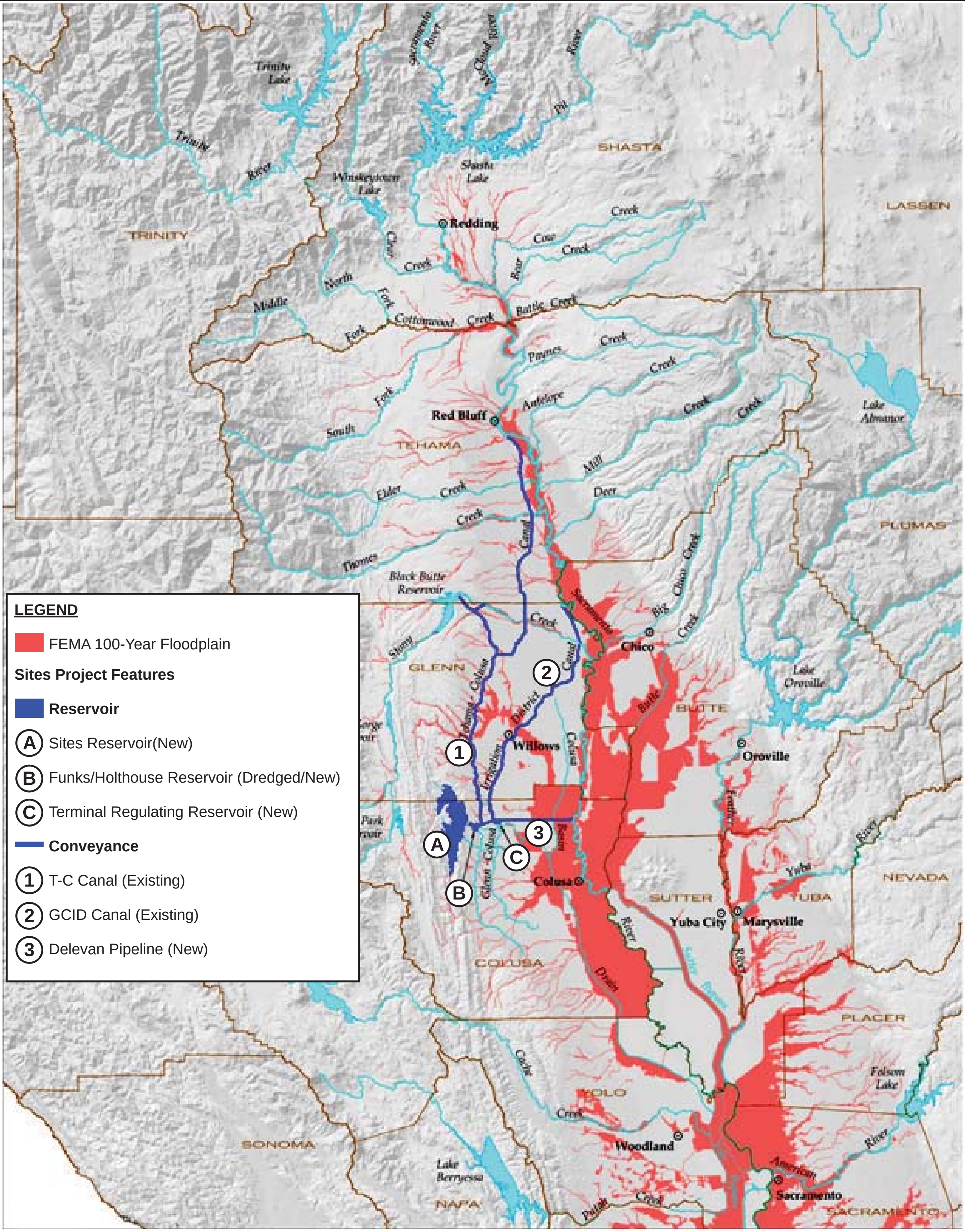
FIGURE 9-2A
Sacramento Valley Flood Control System Estimated Channel Capacity (North)
North-of-the Delta Offstream Storage Project



Source: Modified from Department of Water Resources, Division of Flood Management, November 2003 Sacramento Valley Flood Control System Map.

N

FIGURE 9-2B
Sacramento Valley Flood Control System Estimated Channel Capacity (South)
North-of-the Delta Offstream Storage Project



Source: Federal Emergency Management Agency (FEMA), Q3 Flood Data.

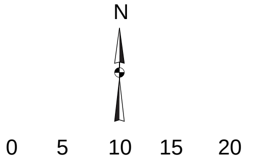


FIGURE 9-3
100-Year Floodplain Delineation Relative to the Project Facilities
North-of-the Delta Offstream Storage Project

WBG020812033556SAC

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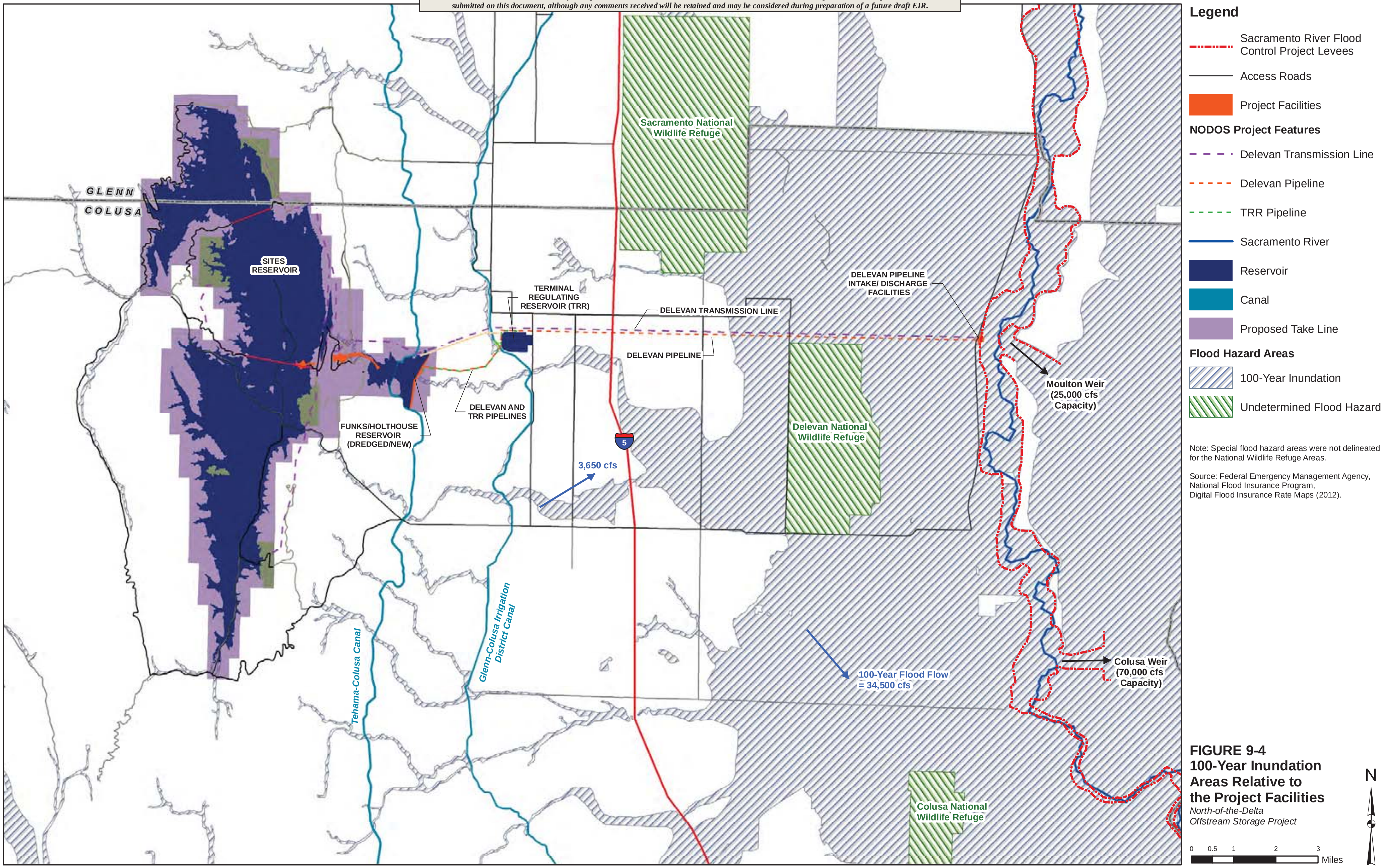


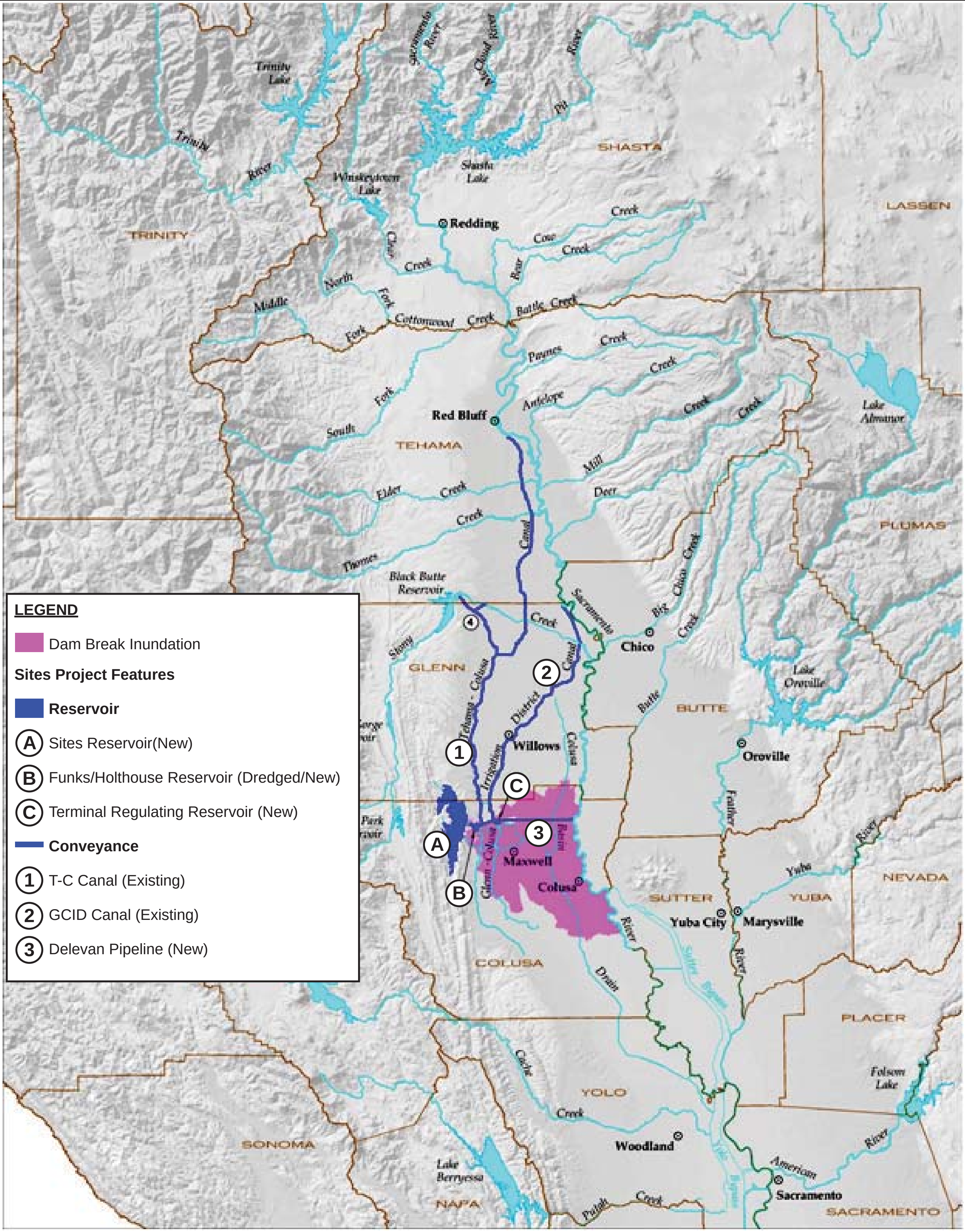
Note: Special flood hazard areas were not delineated for the National Wildlife Refuge Areas.

Source: Federal Emergency Management Agency, National Flood Insurance Program, Digital Flood Insurance Rate Maps (2012).

FIGURE 9-4
100-Year Inundation Areas Relative to the Project Facilities
North-of-the-Delta Offstream Storage Project

Path: W:\NODOS\MapFiles\Chapters\Flood\Figure9-5_Flood.mxd

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.



Source: Federal Emergency Management Agency (FEMA), Q3 Flood Data.

FIGURE 9-5
Dam Break Inundation Area for the Project Facilities
North-of-the Delta Offstream Storage Project

10. Groundwater Resources

10.1 Introduction

This chapter provides a description of the groundwater resources setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Groundwater resources refer to the groundwater aquifer system(s) including groundwater infrastructure (i.e., existing groundwater wells and their distribution facilities in the vicinity of the Project).

The regulatory setting for groundwater resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

10.2 Environmental Setting/Affected Environment

Throughout the State, the availability and predictability of groundwater for withdrawal is influenced by the geology and topography of the region, because groundwater may occur in alluvial sediment or fractured rock aquifers. The characteristics of these aquifers are described below.

Alluvial sediment aquifers occur primarily in valley areas where the lower elevation of the ground surface has provided a location for eroded sediment to collect and accumulate. Groundwater is collected and stored in the pore spaces between the pieces of eroded material. For example, groundwater is found between the stones in a gravel bed. The groundwater production associated with alluvial sediment aquifers varies from very little to large quantities based on the composition of the sediment and availability of recharge water. Wells in alluvial sediment aquifers provide water for many uses including domestic, irrigation, industrial, environmental, and public water supply.

Fractured rock aquifers are found primarily in mountainous regions where topography prevents the accumulation of significant amounts of eroded material. Groundwater collects and is stored in the fractures of the solid rock formations. Fractured rock aquifers are generally considered to produce less groundwater and to be less predictable water sources than alluvial aquifers. Wells in fractured rock aquifers provide water for many of the same uses as the wells in alluvial sediment aquifers.

10.2.1 Extended Study Area

10.2.1.1 Hydrogeology and Groundwater Resources

California is divided into 10 hydrologic regions based on surface water hydrology. Brief descriptions of the groundwater hydrogeology and resources within the hydrologic regions where changes in water supply distribution may occur as a result of Project implementation are provided below.

North Coast Hydrologic Region

Groundwater development in the North Coast Hydrologic Region occurs in areas of lower ground surface elevation and slope where eroded material can be deposited and accumulate. These include areas along the coast, near the mouths of or adjacent to major rivers, and in the inland valleys. Groundwater reliability varies significantly from area to area (DWR, 2003).

San Francisco Bay Hydrologic Region

Groundwater development in the San Francisco Bay Hydrologic Region is limited because coarse alluvial sediments where fresh groundwater is stored are thin in many areas. In more heavily used basins, fresh groundwater sediments are moderately thick. Groundwater availability varies significantly from area to area (DWR, 2003).

Central Coast Hydrologic Region

Groundwater development in the Central Coast Hydrologic Region is extensive. Aquifer reliability and storage vary greatly, ranging from large alluvial valleys with thick aquifer systems to small inland valleys and coastal terraces where large-scale groundwater production is not possible (DWR, 2003).

South Coast Hydrologic Region

Groundwater development in the South Coast Hydrologic Region is extensive. Groundwater is produced almost exclusively from alluvial aquifer systems. Aquifer production can be as high as thousands of gallons per minute (gpm) in large municipal wells (DWR, 2003).

Sacramento River Hydrologic Region

Groundwater development in the Sacramento River Hydrologic Region is widespread. The Sacramento Valley is considered to be one of the most productive aquifer systems in the state. Extensive deposition of alluvial material in the Sacramento Valley has created large, reliable, and productive aquifer systems. Groundwater production and reliability are less predictable from the alluvial sediments in mountain basins, but many produce significant amounts of groundwater. Small scale production is achieved from fractured rock aquifer systems outside of and along the edges of the alluvial basins (DWR, 2003).

San Joaquin River Hydrologic Region

Groundwater development in the San Joaquin River Hydrologic Region is extensive. Groundwater is produced from thick beds of alluvium and consolidated rocks. Groundwater production is generally high, ranging between 300 and 5,000 gpm (DWR, 2003).

Tulare Lake Hydrologic Region

Groundwater development in the Tulare Lake Hydrologic Region is extensive. Groundwater is produced from thick beds of alluvium in the San Joaquin Valley subbasins. The maximum thickness of freshwater aquifer deposits is approximately 4,400 feet. Groundwater production in these areas generally ranges from 300 to 4,000 gpm. Aquifer deposits in the smaller basins surrounding the San Joaquin Valley are thinner and generally produce less groundwater, averaging less than 500 gpm (DWR, 2003).

South Lahontan Hydrologic Region

Groundwater development in the South Lahontan Hydrologic Region is limited to populated areas. Groundwater is produced almost exclusively from alluvial sediments, and production varies greatly from basin to basin (DWR, 2003).

Colorado River Hydrologic Region

Groundwater is produced from alluvial aquifer systems in many of the region's subbasins. The thickness and production associated with the various aquifers varies greatly from basin to basin. Some aquifers can produce thousands of gallons per minute to properly designed wells (DWR, 2003).

10.2.2 Secondary Study Area

10.2.2.1 Hydrogeology and Groundwater Resources

The Secondary Study Area includes small portions of the North Coast and San Francisco Bay hydrologic regions and most of the Sacramento River Hydrologic Region. More detailed descriptions of the geologic setting and formations for the Secondary Study Area are included in Chapter 16 Geology, Minerals, Soils, and Paleontology.

North Coast Hydrologic Region

The portion of the North Coast Hydrologic Region that is included in the Secondary Study Area consists of areas surrounding Trinity Lake, Lewiston Lake, the Clear Creek Tunnel, the Trinity River, and the Klamath River downstream of the Trinity River. North and northeast of Redding, the valley meets the base of the Klamath Mountain Range.

In general, the geologic setting for this area consists of ancient marine-type sedimentary rocks uplifted by massive granitic intrusions. Groundwater is produced from eroded and redeposited material that often collects along stream and river channels and in valley areas within the mountain region. Some groundwater is also produced from fractured hard rock aquifers. Groundwater production in the mountain region is less predictable and usually less productive than in most parts of the valley because the geologic material storing the groundwater is much more limited.

San Francisco Bay Hydrologic Region

The portion of the San Francisco Bay Hydrologic Region that is included in the Secondary Study Area consists of areas surrounding the Sacramento-San Joaquin Delta (Delta), Suisun Bay, San Pablo Bay, and San Francisco Bay.

In general, the geologic setting for these areas consists of alluvial deposits of material eroded from rocks higher in the watersheds that were transported and deposited by rivers and streams feeding into the Region. Groundwater is produced from these alluvial sediments. Groundwater production varies from area to area because coarse sediments that store groundwater vary in thickness.

Sacramento River Hydrologic Region

The northern Sacramento Valley is bordered by the Klamath Mountain on the north, a portion of the Northern Coast Ranges to the west, and bordered on the east by the southern part of the Cascade Range and northern part of the Sierra Nevada. The valley is approximately 12 miles wide near the City of Red Bluff and approximately 38 miles wide south of the Sutter Buttes. The length of the valley is roughly

60 miles. Included in the Sacramento River Hydrologic Region are Shasta Lake, Keswick Reservoir, the Sacramento River, Spring Creek, Clear Creek, Whiskeytown Lake, Lake Oroville, the Thermalito Complex, the Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, and the American River.

The northern Sacramento Valley is underlain by an extensive alluvial aquifer system. Along the edges of the basin, near the base of the mountains, groundwater is also produced from limited fractured rock aquifers. In areas outside of the Sacramento Valley, groundwater occurs in alluvium deposited in smaller valleys and along stream and river channels. Groundwater is also produced from fractured rock areas and in the Cascade Range from sand and gravel aquifers found between ancient lava flows.

The boundaries of the part of the groundwater basin within the Secondary Study Area are formed by the foothills of the Sierra and Cascade mountain ranges to the east, the Coast Range to the west, and Klamath Mountains to the northwest. The region extends south from the Modoc Plateau and Cascade Range at the Oregon border, to the Sacramento-San Joaquin Delta (DWR, 2003).

The primary fresh groundwater-bearing geologic formations in the northern Sacramento Valley are the Tuscan, Tehama, and Laguna Formations. The valley stratigraphy is oriented approximately west to east between the cities of Willows and Oroville. The relationship between the geologic formations is depicted on this cross-section and this relationship is basically consistent through much of the valley.

The Tuscan Formation is derived primarily from mud flow and reworked volcanic deposits. The origin is near Lassen Peak, north and east of the Secondary Study Area. The mud flows of the Tuscan can be seen in outcrops on the eastern side of the valley from north of Oroville to Redding. The flows continued into the valley as far west as where Interstate 5 (I-5) is located in some locations, but were buried with more recent alluvial material. The composition of the Tuscan Formation in the valley consists of layers of gravel, sand, silt, and clay.

The Tehama Formation is derived from material eroded from the Coast Range and Klamath Mountains. The rolling hills formed by the Tehama Formation can be seen nearly uninterrupted from Cottonwood in the north to well beyond the southern end of the Secondary Study Area. North of Cottonwood, the Tehama Formation is exposed across the valley floor from Palo Cedro in the east to the Coast Range foothills in the west. Similar to the Tuscan Formation, the Tehama Formation is present in both surface exposures and in the subsurface of the valley where it is overlain by more recent alluvial material. In the subsurface, the Tehama Formation extends east beyond the Sacramento River in most locations within the Secondary Study Area. The composition of the Tehama Formation in the valley consists of layers of gravel, sand, silt, and clay.

The Laguna Formation is composed of material eroded from the Sierra Nevada. Similar to the Tehama Formation, the Laguna Formation is exposed at the surface in rolling hills. Exposures of the Laguna Formation can be seen at the base of the Sierra Nevada on the east side of the valley between Oroville and Sacramento. In the subsurface, the Laguna Formation extends west to approximately the Sacramento River. The Laguna Formation consists of primarily layers of gravel, sand, and silt.

Recent alluvial formations including the Red Bluff, Riverbank, Modesto, and Basin deposits cover the Tuscan, Tehama, and Laguna formations throughout much of the valley with up to 200 feet of gravel, silt, and clay. In localized areas, the recent alluvium can be a significant source of groundwater for domestic, agricultural, and public use, but generally these units provide a modest amount of water to primarily domestic users (DWR, 2003).

10.2.3 Primary Study Area

10.2.3.1 Hydrogeology and Groundwater Resources

Sites Reservoir Inundation Area, Dams, Recreation Areas, Roads and South Bridge, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Site Reservoir Inlet/Outlet Structure, and Sites Electrical Switchyard

Local Hydrogeology

The proposed location for the Sites Reservoir Inundation Area would completely inundate both the Funks and Antelope Creek groundwater basins. These groundwater basins consist primarily of shallow (generally less than 100 feet) alluvial deposits (DWR, 2003). These alluvial deposits are Late Quaternary (8,000 years ago) in age and occur within the reservoir footprint, primarily along the valleys of Stone Corral, Antelope, Funks, and Grapevine creeks. The deposits consist of fine-grained sands, silts, and clays occurring as stream channel and localized floodplain deposits.

Most of the wells in these groundwater basins are designed to produce water from the underlying rock formation (the Great Valley Sequence). The Great Valley Sequence is comprised of marine, clastic sedimentary rock consisting of siltstone, shale, sandstone, and conglomerate. The sequence has a maximum thickness of 15,000 feet. Groundwater resources from this formation are limited due to poor water bearing and water quality characteristics. More detailed descriptions of the geologic setting and formations are included in Chapter 16 Geology, Minerals, Soils, and Paleontology.

Local Groundwater Infrastructure

As of 2009, there are approximately 26 wells that have been constructed within an approximate one-mile radius of the Sites Reservoir footprint. Table 10-1 presents a summary of well data for these wells including the number of wells, well depth, well use, depth to water, and well yield, for the appropriate Township, Range, and Section. The data presented here are from the California Department of Water Resources (DWR) well completion report data set. All data are reported as it was submitted by the well driller at the time of drilling and development. None of this data was verified by DWR staff and conditions may have changed since the time of drilling. Additional wells may be present in the study area that were not reported to DWR by the driller.

As shown in Table 10-1, 10 wells are constructed to a depth of 100 feet or greater, the deepest well being 201 feet deep. Well yields in the area are low, ranging from a high of 60 gpm to a low of zero or no measurable yield, and averaging 14 gpm. The depth to water in the area, based on well completion reports, ranges from one foot to 30 feet below ground surface, with an average depth of approximately 17 feet (DWR, 2011).

Table 10-2 provides a summary of well data for each type of well (e.g., domestic or irrigation), as reported on well completion reports submitted to DWR. As shown, half of the wells in the area are domestic wells constructed to depths of approximately 77 feet with yields averaging approximately 15 gpm.

Stock wells are the second most common well type in the area constructed to depths of approximately 85 feet. Well yields from stock wells average approximately 18 gpm.

Table 10-1
Wells Located Within a One-Mile Radius of the Proposed Sites Reservoir Footprint

Township, Range, and Section Number	Number of Wells within Section	Well Depth (feet)	Well Use	Depth to Water (Feet)*	Well Yield (gpm)*
T16N R04W Sec 06	1	201	Stock	20	20
T16N R04W Sec 19	2	119	Domestic	21	15
		31	Domestic	16	15
T16N R05W Sec 12	2	85	Irrigation	NA	NA
		75	Stock	NA	0
T16N R05W Sec 23	1	86	Stock	4	8
T16N R05W Sec 24	1	140	Domestic	12	7
T17N R04W Sec 06	1	20	Stock	10	60
T17N R04W Sec 08	1	105	Stock	7	NA
T17N R04W Sec 16	1	124	Domestic	17	12
T17N R04W Sec 19	1	29	Stock	18	2
T17N R04W Sec 20	13	84	Domestic	10	10
		37	Domestic	18	5
		47	Domestic	NA	NA
		45	Domestic	26	NA
		28	Domestic	NA	NA
		45	Domestic	NA	NA
		200	Industrial	30	3
		100	Industrial	17	20
		70	Domestic	30	50
		160	Domestic	22	25
T17N R04W Sec 31	1	60	Stock	20	10
T17N R05W Sec 24	1	80	Domestic	30	5
T18N R05W Sec 13	1	100	Domestic	10	10
T18N R05W Sec 15	1	100	Stock	10	10
T18N R05W Sec 25	1	38	Domestic	1	NA

*Depth to water and well yield values are based on estimates provided by the driller at the time of drilling in well completion reports.

Notes:

Further evaluation of well completion report data thru 2011 indicates no additional well drilling between 2009 and 2011. DWR well completion report data set may not include all wells.

gpm = gallons per minute
NA = Not Available

Source: DWR, 2011.

Table 10-2
Summary of Well Data By Well Type for Wells Located within a One-Mile Radius of the Sites Reservoir Footprint

Well Type	Number of Wells	Average Well Depth (feet)	Average Depth of Water (feet)	Average Well Yield (gpm)
Domestic	15	77	17.75	15.4
Irrigation	1	85	NA	NA
Industrial	2	150	23.5	11.5
Stock	8	85	12.7	18.33
Other*	4	28	NA	NA

Notes:

Further evaluation of well completion report data thru 2011 indicates no additional well drilling between 2009 and 2011. DWR well completion report data set may not include all wells.

gpm = gallons per minute
NA = Not Available

Source: DWR, 2011.

Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Tehama-Colusa Canal, Field Office Maintenance Yard, Terminal Regulating Reservoir Pipeline, and Terminal Regulating Reservoir Pipeline Road

Local Hydrogeology

The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard (proposed location), T-C Canal (proposed modifications), and the Field Office Maintenance Yard, TRR Pipeline, and TRR Pipeline Road would overlie Great Valley Sequence and Holocene basin deposits. The Great Valley Sequence is comprised of marine clastic sedimentary rock consisting of siltstone, shale, sandstone, and conglomerate. The sequence has a maximum thickness of 15,000 feet. Groundwater resources in this area are limited due to the poor water bearing and water quality characteristics.

The basin deposits consist of silt and clay deposited in low-lying floodplain areas adjacent to major streams. Permeability of basin deposits is generally low and groundwater occurs in limited quantities.

Local Groundwater Infrastructure

As of 2009, there are approximately three wells that have been constructed and one test hole drilled within an approximate one-mile radius of the proposed Holthouse Reservoir Complex. Table 10-3 presents a summary of well data for these wells including the number of wells, well depth, well use, depth to water, and well yield, for the appropriate township, range, and section. The data presented here are from the DWR well completion report data set. All data are reported as it was submitted by the well driller at the time of drilling and development. None of this data was verified by DWR staff and conditions may have changed since the time of drilling. Additional wells may be present in the study area that were not reported to DWR by the driller.

The constructed well depths ranged from 124 feet to 240 feet and the reported well yields were low at 12 and 14 gpm. A depth to water measurement was only reported on the well completion report for two wells, and those measurements were 20 and 41 feet below ground surface. One well was drilled for industrial uses, and the other two for domestic water supplies (DWR, 2011).

Table 10-3
Wells Located Within a One-Mile Radius of the Proposed Holthouse Reservoir Complex and TRR Pipeline

Section Number	Number of Wells within Section	Well Depth (feet)	Well Use	Depth to Water (Feet)*	Well Yield (gpm)*
T17N R04W Sec 11	1	240	Industrial	20	14
T17N R04W Sec 12	2	80	Domestic	41	11
		240	Test Hole	NA	NA
T17N R04W Sec 16	1	124	Domestic	NA	12

*Depth to water and well yield values are based on estimates provided by the driller at the time of drilling in well completion reports.

Notes:

Further evaluation of well completion report data thru 2011 indicates no additional well drilling between 2009 and 2011. DWR well completion report data set may not include all wells.

gpm = gallons per minute
NA = Not Available

Source: DWR, 2011.

Glenn-Colusa Irrigation District Canal

Local Hydrogeology

The GCID Canal (proposed modifications) crosses deposits of the Riverbank Formation and basin deposits. The Riverbank Formation is composed of terrace deposits that consist of poorly consolidated gravel, sand, and silt. These deposits are found along the Sacramento River and adjacent tributaries and are up to 200 feet thick. Permeability of the Riverbank Formation is moderate to high, and yields of domestic wells are moderate.

Basin deposits consist of silt and clay deposited in low-lying floodplain areas adjacent to major streams. Permeability of basin deposits is generally low, and groundwater occurs in limited amounts.

Delevan Pipeline, Delevan Transmission Line, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities, and Delevan Discharge Facility

Local Hydrogeology

The Delevan Pipeline, Delevan Transmission Line, Delevan Pipeline Electrical Switchyard, Delevan Pipeline Intake Facilities, and Delevan Discharge Facility would overlie the Great Valley Sequence, Riverbank Formation, and basin deposits.

The Great Valley Sequence is comprised of marine, clastic sedimentary rock consisting of siltstone, shale, sandstone, and conglomerate. The sequence has a maximum thickness of 15,000 feet. Groundwater resources from this formation are limited due to poor water bearing and water quality characteristics.

The Riverbank Formation is composed of terrace deposits that consist of poorly consolidated gravel, sand, and silt. These deposits are found along the Sacramento River and adjacent tributaries and are up to 200 feet thick. Permeability of the Riverbank Formation is moderate to high, and yields of domestic wells are moderate.

Basin deposits consist of silt and clay deposited in low-lying floodplain areas adjacent to major streams. Permeability of basin deposits is generally low, and groundwater occurs in limited amounts.

Local Groundwater Infrastructure

As of 2009, there are approximately 35 wells that have been constructed within approximately one mile of the Delevan Pipeline construction area. Table 10-4 presents a summary of well data for these wells including the number of wells, well depth, well use, depth to water, and well yield, for the appropriate township, range, and section. The data presented here are from the DWR well completion report data set. All data are reported as it was submitted by the well driller at the time of drilling and development. None of this data was verified by DWR staff and conditions may have changed since the time of drilling. Additional wells may be present in the study area that were not reported to DWR by the driller.

Table 10-4
Wells Located Within One-Mile of the Delevan Pipeline and Associated Facilities

Section Number	Number of Wells within Section	Well Depth (feet)	Well Use	Depth to Water (Feet)*	Well Yield (gpm)*
T17N R02W Sec 07	2	119	Domestic	NA	NA
		180	Domestic	NA	NA
T17N R02W Sec 08	2	260	Domestic	13	60
		194	Domestic	NA	NA
T17N R02W Sec 09	5	812	Irrigation	24	8300
		280	Monitoring	NA	NA
		540	Monitoring	NA	NA
		863	Monitoring	NA	NA
		18	Other	NA	NA
T17N R02W Sec 11	3	260	Irrigation	NA	NA
		360	Irrigation	5	5000
		260	Domestic	NA	NA
T17N R02W Sec 12	4	600	Irrigation	NA	NA
		630	Domestic	23	5105
		350	Unknown	NA	NA
		760	Irrigation	NA	5000
T17N R03W Sec 07	2	145	Domestic	NA	NA
		142	Unknown	NA	NA
T17N R03W Sec 08	3	240	Domestic	6	200
		70	Domestic	NA	NA
		450	Domestic	NA	NA
T17N R03W Sec 09	6	175	Domestic	NA	NA
		330	Unknown	NA	NA
		200	Domestic	NA	NA
		192	Domestic	NA	NA
		331	Domestic	NA	NA
		232	Irrigation	NA	NA
T17N R03W Sec 10	1	200	Domestic	NA	NA
T17N R03W Sec 11	3	292	Domestic	NA	NA
		103	Domestic	NA	NA
		120	Domestic	NA	NA

Table 10-4
Wells Located Within One-Mile of the Delevan Pipeline and Associated Facilities

Section Number	Number of Wells within Section	Well Depth (feet)	Well Use	Depth to Water (Feet)*	Well Yield (gpm)*
T17N R03W Sec 12	4	560	Domestic	30	NA
		284	Domestic	NA	NA
		675	Domestic	NA	NA
		13	Unknown	NA	NA

*Depth to water and well yield values are based on estimates provided by the driller at the time of drilling in well completion reports.

Notes:

Further evaluation of well completion report data thru 2011 indicates no additional well drilling between 2009 and 2011. DWR well completion report data set may not include all wells.

gpm = gallons per minute
NA = Not Available

Source: DWR, 2011.

The well depths ranged from 13 feet to 863 feet. The reported data for well yields were limited, but ranged between 60 and 8,300 gpm. The depth to water measurements ranged between five and 30 feet below ground surface, with an average depth of 17 feet. The intended use of the wells reported on the well completion reports is as follows: 20 domestic, seven irrigation, four unknown, three monitoring, and one other (DWR, 2011).

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Local Hydrogeology

The TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and GCID Canal Connection to the TRR would overlie Riverbank Formation and basin deposits.

The Riverbank Formation is composed of terrace deposits that consist of poorly consolidated gravel, sand, and silt. These deposits are found along the Sacramento River and adjacent tributaries and are up to 200 feet thick. Permeability of the Riverbank Formation is moderate to high, and yields of domestic wells are moderate.

Basin deposits consist of silt and clay deposited in low-lying floodplain areas adjacent to major streams. Permeability of basin deposits is generally low, and groundwater occurs in limited amounts.

Local Groundwater Infrastructure

As of 2009, there are approximately 10 wells that have been constructed within an approximate one-mile radius of the proposed TRR. Table 10-5 presents a summary of well data for these wells including the number of wells, well depth, well use, depth to water, and well yield, for the appropriate township, range, and section. The data presented here are from the DWR well completion report data set. All data are reported as it was submitted by the well driller at the time of drilling and development. None of this data was verified by DWR staff and conditions may have changed since the time of drilling. Additional wells may be present in the study area that were not reported to DWR by the driller.

Table 10-5
Wells Located Within a One-Mile Radius of the Terminal Regulating Reservoir

Section Number	Number of Wells within Section	Well Depth (feet)	Well Use	Depth to Water (Feet)*	Well Yield (gpm)*
T17N R03W Sec 05	1	130	Domestic	4	NA
T17N R03W Sec 06	1	105	Domestic	20	50
T17N R03W Sec 07	2	145	Domestic	6	NA
		142	Unknown	NA	NA
T17N R03W Sec 08	3	240	Domestic	6	200
		70	Domestic	17	NA
		151	Domestic	20	NA
T17N R03W Sec 17	2	400	Domestic	8	200
		100	Domestic	20	NA
T17N R03W Sec 18	1	160	Domestic	12	70

*Depth to water and well yield values are based on estimates provided by the driller at the time of drilling in well completion reports.

Notes:

Further evaluation of well completion report data thru 2011 indicates no additional well drilling between 2009 and 2011. DWR well completion report data set may not include all wells.

gpm = gallons per minute
NA = Not Available

Source: DWR, 2011.

The well depths ranged from 70 feet to 400 feet. The reported data for well yields were limited, but ranged between 50 and 200 gpm. The depth to water measurements ranged between four and 20 feet below ground surface with an average depth of 12.5 feet. Nine of the 10 wells were drilled for domestic water supply. The intended use of the tenth well is unknown (DWR, 2011).

Project Buffer

Local Hydrogeology

The Project Buffer would surround groupings of Project facilities. The Project Buffer, therefore, would overlie the same formations and deposits as described for each of the Project facilities that are surrounded by the Project Buffer.

Local Groundwater Infrastructure

The Project Buffer extends from the Project facility footprints to the edge of the nearest land parcel; the distance of the Project Buffer boundary from any facility footprint is less than one mile. The well data presented for the Project facilities includes all wells located within one mile of the facilities and, therefore, includes wells that are located within the buffer boundary.

10.3 Environmental Impacts/Environmental Consequences

10.3.1 Regulatory Setting

Groundwater resources are regulated at the federal, State, and local levels. Management of groundwater resources occurs at the local level. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

10.3.1.1 Federal Plans, Policies, and Regulations

- National Environmental Policy Act
- Federal Safe Drinking Water Act
- Federal Antidegradation Policy
- Clean Water Act

10.3.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act

10.3.1.3 Regional and Local Plans, Policies, and Regulations

The State of California does not have a statewide regulatory permit process for groundwater extraction. Groundwater management has remained primarily a local responsibility with relatively little control exerted by the California Legislature. The authority to implement some sort of groundwater management practice has been provided to established local water agencies, special act districts, and counties. The authority of these districts varies greatly with the specific authorization that established the district – from granting the authority to establish a groundwater management plan to (in a few cases) monitoring and limiting extraction during overdraft conditions (DWR 2003).

Many of the counties within the Extended Study Area, and the majority of the counties in the Secondary Study Area, have established groundwater ordinances. Within the Primary Study Area, Colusa and Glenn counties require permits for pumping groundwater for export or for substituting groundwater for surface water that was exported. However, these groundwater ordinances do not pertain to activities related to the Project because no groundwater would be extracted as part of the Project.

10.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criterion for hydrology and water quality that is relevant to groundwater resources:

Would the Project:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Substantial depletion of groundwater supplies or substantial interference with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

- Increases in groundwater levels such that there would be adverse effects to environmental conditions, existing land uses, or planned uses for which permits have been granted.

10.3.3 Impact Assessment Assumptions and Methodology

10.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to groundwater resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation, increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge Facilities would be required.

10.3.3.2 Methodology

A combination of data, published reports, and professional experience with activities similar to those proposed was used to evaluate the potential impacts to groundwater resources from the alternatives. The data (detailed below) were used to determine the existing groundwater infrastructure, identify and estimate the aquifer properties of the underlying geologic material, and anticipate potential impacts that could result from Project-related activities in the three study areas.

The Extended and Secondary study area impact assessments relied on hydrologic and operational modeling performed using CALSIM II, which provided monthly river flows, and reservoir water surface elevations derived from monthly river flows and end-of-month reservoir storages, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). Detailed discussion of the CALSIM II model is provided in Appendix 6B. These modeling results were used in combination with professional judgment to assess the potential impacts of operation of the alternatives on groundwater resources.

DWR Bulletin 118-03 (DWR, 2003) was referenced to identify the groundwater basins within the Extended, Secondary, and Primary study areas, and to determine in more detail the aquifer properties of the geologic material within those basins.

A survey of DWR well completion report records (DWR, 2011) was conducted to determine the number, use, and depth of wells in the Primary Study Area. The well completion reports also provided general information regarding the geology and aquifer properties of the geologic formations encountered by the well drilling activities.

Previously completed projects, including the Thermalito Afterbay, and their resulting impacts were evaluated to determine the type and severity of impacts that might result in the Primary Study Area from proposed Project-related activities that would impound water.

10.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

10.3.5 Impacts Associated with the No Project/No Action Alternative

10.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to groundwater levels (either decrease or increase) has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** resulting in the depletion of groundwater resources, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger human population could be expected to cause increased demand for groundwater resources. Groundwater extraction has exceeded groundwater recharge in several areas of the Sacramento and San Joaquin hydrologic regions. Continued groundwater extraction at rates that exceed groundwater recharge **could have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion.

San Luis Reservoir

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

With implementation of the No Project/No Action Alternative, San Luis Reservoir would continue to experience water level fluctuations similar to Existing Conditions. Groundwater recharge would not be expected to be substantially adversely affected by continued fluctuations. Therefore, continued fluctuations in water levels at San Luis Reservoir **would not have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion.

10.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion for the Extended Study Area. Population growth could result in increased use of existing aquifers. Groundwater level data indicate that groundwater extraction has likely exceeded groundwater recharge in several areas of the Sacramento River Hydrologic Region. These areas are scattered throughout the region; there are areas with higher groundwater overdraft rates in Glenn County, and south of the city of Williams in Colusa County. These areas are located in the Sacramento Valley floor groundwater basins. If the No Project/No Action Alternative is implemented, the overdraft rates would likely continue and possibly increase. Continued groundwater extraction at rates that exceed groundwater recharge **could have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion for the Extended Study Area.

10.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion for the Extended Study Area. In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **would not have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions. With implementation of the No Project/No Action Alternative, local landowners and tenants would continue to use groundwater for domestic use and for crop irrigation. Because population growth is projected to be minimal in this area, groundwater extraction would not be expected to increase substantially. Therefore, continued groundwater use in the Primary Study Area with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion for the Extended Study Area. In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **would not have a substantial adverse effect** on groundwater resources, when compared to Existing Conditions.

10.3.6 Impacts Associated with Alternative A

10.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

There would be no Project construction or maintenance activities in the Extended Study Area; therefore, there would be **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative. There would be no proposed Project operational activities or results from those activities that would result in a substantial depletion of groundwater supplies in the Extended Study Area. Improvement in surface water supply reliability for agricultural, municipal, and industrial water users as a result of the Project would reduce the need for extracting groundwater and/or provide some additional applied water for deep percolation recharge of the aquifer system; groundwater supplies would, therefore, not be depleted or reduced. Therefore, increased surface water supply reliability would have a **less-than-significant impact** on groundwater resources in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

The provision of an alternate source of refuge water supply would not affect rates of groundwater use, and would, therefore, have **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion for the Extended Study Area. Improvement in surface water supply reliability for agricultural, municipal, and industrial water users as a result of the Project could result in stabilization or modest increases in groundwater resources in CVP/SWP areas due to slightly increased recharge rates or a reduced need for groundwater extraction, but not at significant levels. Therefore, increased surface water supply reliability would have a **less-than-significant impact** on groundwater resources in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

San Luis Reservoir

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that there would be continued water level fluctuations at San Luis Reservoir, but the fluctuations would occur more often and could be more severe. Severe reservoir level drawdowns could result in reduced seepage, which could reduce local groundwater recharge. However, San Luis Reservoir currently experiences severe water level fluctuations, and historic groundwater levels should not be substantially affected by continued fluctuations at an increased rate. Therefore, the increased fluctuations in water levels at San Luis Reservoir would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Increased fluctuations in water levels at San Luis Reservoir would not increase groundwater levels, and would, therefore, have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

10.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

There are no Project-related construction, operation, or maintenance activities that would result in a substantial depletion of groundwater supplies in the Secondary Study Area. Project operational activities would result in improved surface water storage in reservoir facilities within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative, which could increase infiltration that recharges groundwater in that area. Changes to the flow regime of the rivers, creeks, and bypasses could result in changes in the rate of groundwater recharge, but the amount of change is likely to be proportional to the change in flow, which is variable throughout the system. These changes are not expected to substantially affect groundwater recharge. Project diversions would not be expected to adversely affect groundwater recharge rates in areas where groundwater extraction has likely exceeded groundwater recharge because Project diversions would occur during periods of excess surface flows and storm events. Therefore, changes in reservoir storage and flow regime would have a **less-than-significant impact** on groundwater resources within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative. Construction, operation, and maintenance of an additional pump at the Red Bluff Pumping Plant would have **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative, because it would not extract groundwater.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Potential increased infiltration resulting from improved surface water storage could increase groundwater recharge rates. However, seepage is not expected to increase at a rate that would have a significant effect on groundwater resources. Therefore, changes in reservoir storage and flow regime would have a **less-than-significant impact** on groundwater resources within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative. Construction, operation, and maintenance of an additional pump at the Red Bluff Pumping Plant would have **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative, because it would not increase groundwater recharge.

10.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction and the initial filling of Sites Reservoir would completely inundate both the Funks and Antelope Creek groundwater basins. Approximately 26 groundwater wells that are located in the inundation area would no longer be functional, but there would no longer be any use for the wells after the reservoir is inundated.

Operation and maintenance activities would result in a wide fluctuation of water stored in the Sites Reservoir during the year, when compared to Existing Conditions and the No Project/No Action Alternative. Similar to the impacts discussed in the construction section, this fluctuation would likely result in localized changes in groundwater recharge. Because of the limited groundwater use and infrastructure in the area surrounding the reservoir, the resulting impact would likely be undetectable. Therefore, construction, operation, and maintenance of Sites Reservoir would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. In addition, it is likely that, despite the grouting of the underlying rock formations, minimal amounts of water would leak from the reservoir and could increase groundwater recharge in nearby areas outside of the inundation area. However, groundwater use and infrastructure in the area surrounding the reservoir is very limited, and the permeability of the geologic material is generally low, so the impact to groundwater users and land use would likely be undetectable. Therefore, construction, operation, and maintenance of Sites Reservoir would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Reservoir Dams

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Golden Gate Dam, Sites Dam, and the seven saddle dams would be located outside of the Funks and Antelope Creek groundwater basins. Sites and Golden Gate dams would be constructed on Stone Corral and Funks creeks, respectively; flows to those creeks would be maintained during construction. Some redirection of creek flows and stormwater management during construction may result in very minor redirection of groundwater recharge, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance activities of the dam structures would not impede groundwater recharge. Therefore, the construction, operation, and maintenance activities associated with these dams would have **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Operation and maintenance activities of the dam structures would not significantly increase groundwater recharge. Therefore, the construction, operation, and maintenance activities associated with these dams would have **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

The recreation areas would be located outside of the Funks and Antelope Creek groundwater basins, and no deep subsurface construction would be required; therefore, their development would result in **no impact** to groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative. Groundwater would not be used during the construction and maintenance of, or as a potable water source for, the recreation areas. Therefore, the construction, operation, and maintenance activities associated with the recreation areas would have **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion.

Road Relocations and South Bridge

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

The construction, operation, and maintenance of these facilities would not require the use of groundwater and would not diminish groundwater recharge. Project construction may require temporary localized lowering of the shallow groundwater. However, the temporary lowering of groundwater levels would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. These activities would, therefore, have **no impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Temporary localized lowering of the groundwater would not increase groundwater levels. The construction, operation, and maintenance of these facilities would therefore have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Electrical Switchyard, Tunnel, Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard may require temporary localized lowering of the shallow groundwater. However, the temporary lowering of groundwater levels would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. Therefore, the construction, operation, and maintenance of these facilities would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Temporary localized lowering of the groundwater would not increase groundwater levels. Therefore, the construction, operation, and maintenance of these facilities would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, Terminal Regulating Reservoir Pipeline, and Terminal Regulating Reservoir Pipeline Road

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction of the Holthouse Reservoir Complex would require the dredging of the existing Funks Reservoir. Dredging activities would require the dewatering of Funks Reservoir for two years, which would likely result in a short-term reduction in groundwater recharge in the local area. The reduction would be small because permeability of the underlying material is low. It is unlikely that it would affect groundwater users because groundwater quantity is low. DWR records only indicate two wells within a mile radius of Funks Reservoir. Therefore, there would be a **less-than-significant impact** on groundwater resources from the dredging of Funks Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Construction of the Holthouse Reservoir Complex facilities, Holthouse Reservoir Electrical Switchyard, TRR Pipeline, and TRR Pipeline Road may require temporary localized lowering of the shallow groundwater in the construction area. However, the temporary lowering of groundwater levels would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. Construction of the Holthouse Reservoir Complex would, therefore, result in a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Dewatering Funks Reservoir would not increase groundwater levels. Therefore, there would be a **less-than-significant impact** on groundwater resources from the dredging of Funks Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Inundation of Holthouse Reservoir would likely lead to higher groundwater levels in a localized area around the reservoir. There are three constructed wells within an approximately one-mile radius of the proposed Holthouse Reservoir. They are located to the north and northeast of the reservoir area. There is limited groundwater flow direction data for the area, but regional trends indicate groundwater flow is in an easterly to southeasterly direction. This trend indicates that it is unlikely that higher groundwater levels would be experienced in the three wells.

It is likely that groundwater levels would increase in the areas immediately south and southeast of the proposed Holthouse Reservoir during Project operation. There are identified sensitive wetlands and orchard crops in the areas that would likely experience an increase in groundwater levels. The groundwater levels could be increased enough to adversely impact wetland hydrology and water chemistry and agricultural operations in these areas. Construction, operation, and maintenance of the Holthouse Reservoir Complex would result in a **potentially significant impact** on groundwater resources south and southeast of Holthouse Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction of the new GCID Canal headgate structure may require temporary localized lowering of the shallow groundwater to allow for the installation of underground equipment in the construction area. The temporary lowering of groundwater levels would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. Construction, operation, and maintenance of the GCID Canal headgate structure would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Temporary localized lowering of the groundwater would not increase groundwater levels. Therefore, the construction, operation, and maintenance of the GCID Canal headgate would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and the Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction of the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and the GCID Canal Connection to the TRR (an energy dissipation bay and inlet channel) may require temporary localized lowering of the shallow groundwater to allow for the installation of underground equipment in the construction area. Temporary lowering of groundwater levels would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. Inundation of the reservoir would likely increase groundwater recharge and lead to higher groundwater levels in a localized area around the reservoir, and therefore, would not result in reduced groundwater supplies. Construction, operation, and maintenance of these facilities would, therefore, have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Filling of the reservoir would likely increase groundwater recharge and lead to higher groundwater levels in a localized area around the reservoir. There are three constructed wells within an approximately one-mile radius of the proposed TRR. They are located in sections north and northeast of the reservoir area. There is limited groundwater flow direction data for the area, but regional trends indicate groundwater flow is in an easterly to southeasterly direction. This trend indicates that it is unlikely that higher groundwater levels would be experienced in the three wells.

It is likely that groundwater levels would increase in the areas immediately south and southeast of the TRR. There are rice, grain, and orchard crops in the areas that would likely experience the increase in groundwater levels. The groundwater levels could be increased enough to adversely impact the agricultural operations in these areas. Construction, operation, and maintenance of the TRR would result in a **potentially significant impact** on groundwater resources surrounding the TRR (especially along the south and southeast sides), when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline, Delevan Transmission Line, and Delevan Pipeline Electrical Switchyard

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction of the Delevan Pipeline, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line tower footings may require temporary localized lowering of the shallow groundwater to allow for the installation of underground equipment in the construction area. The temporary lowering of groundwater would not impact current groundwater uses in the area because the groundwater levels would not be lowered enough or over a wide enough area to impact local groundwater users. Construction, operation, and maintenance of the Delevan Pipeline, Delevan Transmission Line, and Delevan Pipeline Electrical Switchyard would, therefore, have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. Temporary localized lowering of the groundwater would not increase water levels, and therefore, would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would include construction of a forebay facility at the proposed intake location. It is likely that groundwater levels would increase in the areas around the forebay after it is filled. Consequently, groundwater resources would not be reduced or depleted. Construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would result in a **less-than-significant impact** to groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. There are orchard crops located in the areas that would likely experience the increase in groundwater levels. Groundwater levels could be increased enough to adversely impact the agricultural operations in this area.

Construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would, therefore, result in a **potentially significant impact** to groundwater resources in the areas directly surrounding the forebay facility, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact GW Res-1: Substantial Depletion of Groundwater Supplies or Substantial Interference with Groundwater Recharge Resulting in a Net Deficit in Aquifer Volume or a Lowering of the Local Groundwater Table Level, Causing Effects on Existing Land Uses or Planned Uses

Within the Project Buffer, some structures would be demolished, and any agricultural fields that are currently irrigated may not continue to receive irrigation. Any wells associated with those structures or used as irrigation sources may, therefore, no longer be used. The discontinued use of any wells could increase, rather than decrease, groundwater supplies. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses

Refer to the **Impact GW Res-1** discussion. The potential reduction in groundwater extraction rates related to the discontinued use of wells could increase groundwater supplies, but not by enough or over a wide enough area to impact local groundwater levels. Therefore, the acquisition of land within the Project Buffer would have a **less-than-significant impact** on groundwater resources, when compared to Existing Conditions and the No Project/No Action Alternative.

10.3.7 Impacts Associated with Alternative B

10.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) would be the same as described for Alternative A for the Extended Study Area.

10.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) would be the same as described for Alternative A for the Secondary Study Area.

10.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater resources:

- Recreation Areas
- Sites Pumping/Generating Plant

- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprint and construction disturbance area of Sites Reservoir and Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) as described for Alternative A, with the exclusion of the potential impacts associated with the Delevan Pipeline Intake Facility forebay and afterbay that are included in Alternative A, but not Alternative B.

10.3.8 Impacts Associated with Alternative C

10.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) would be the same as described for Alternative A for the Extended Study Area.

10.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) would be the same as described for Alternative A for the Secondary Study Area.

10.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Areas, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) as described for Alternative B.

The boundary of the Project Buffer would be the same for all three alternatives, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on groundwater supplies and recharge (**Impact GW Res-1**) and groundwater levels (**Impact GW Res-2**) as described for Alternative A.

10.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 10-6 for the impacts that have been identified as significant or potentially significant.

Table 10-6
Summary of Mitigation Measures for
NODOS Project Impacts to Groundwater Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact GW Res-2: Increases in Groundwater Levels Resulting in Adverse Effects to Environmental Conditions and/or Existing Land Uses or Planned Uses	Holthouse Reservoir Complex, TRR, Delevan Pipeline Intake Facilities	Potentially Significant	Mitigation Measure GW Res-2: Monitor and Lower Groundwater Levels as Necessary	Less than Significant
	Holthouse Reservoir	Potentially Significant	Mitigation Measure Bot-1e: Minimize Impacts by Siting Facilities Away from Drainage Swales and using BMPs; Conduct Hydrological Studies and Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant or Potentially Significant and Unavoidable

Note:
LOS = Level of Significance

Mitigation Measure GW Res-2: Monitor and Lower Groundwater Levels as Necessary

To minimize impacts to existing land uses from the expected increase in groundwater levels from the development of the Holthouse Reservoir Complex, the TRR, and the Delevan Pipeline Intake Facilities, groundwater level monitoring wells shall be installed around these facilities prior to filling of the reservoirs and forebay to provide existing groundwater level data for these areas. The wells shall be monitored throughout Project operation to determine changes in groundwater levels. Shallow groundwater return wells or French Drains with pumps shall be installed to pump groundwater and return it to the reservoirs and forebay if it is determined necessary to lower the groundwater levels.

Mitigation Measure Bot-1e: Minimize Impacts by Siting Facilities Away from Drainage Swales and using BMPs; Conduct Hydrological Studies and Implement Vegetation Community Mitigation Measures Recommended by USFWS

- DWR and Reclamation shall implement measures that mitigate impacts to alkaline wetland vegetation in the on-site swale to avoid sedimentation of the swale during Project construction, according to recommendations received during consultation with USFWS. DWR and Reclamation shall conduct studies to determine the importance of the headwaters of the swale to the health of the swale and the downstream alkaline marsh.

- DWR and Reclamation shall conduct studies to determine the effects of groundwater pressure on the health of the swale and the marsh. Measures may include protection of nearby similar vegetation communities, or USFWS may determine the effects are unavoidable and there may be no means of mitigation if there are no equivalent nearby vegetation communities that are feasible to protect or enhance.

Implementation of **Mitigation Measure GW Res-2** would reduce the level of significance of Project impacts to groundwater resources to **less than significant**.

Implementation of **Mitigation Measure Bot-1e** would reduce the level of significance of Project impacts to groundwater resources to **less than significant,** or they would remain **potentially significant and unavoidable.**

10.5 References

California Department of Water Resources. (DWR). 2011. Unpublished 2011 Well Completion Report Data.

California Department of Water Resources. (DWR). 2003. Bulletin 118-03 California's Groundwater. 246p. pp 108, 122, 131, 140, 149, 159, 169, 177, 194, 204.

11. Groundwater Quality

11.1 Introduction

This chapter describes the groundwater quality setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Groundwater quality can be affected by both natural and human-caused activities. In natural systems, the quality of groundwater results from geochemical reactions between the water and rock as the water flows from areas of recharge. Typically, the longer that groundwater remains in contact with soluble materials, the greater the concentrations of dissolved materials in the water (in addition to the effects of temperature, pressure, and solubility). The quality of groundwater can also change as a result of the mixing of waters from different aquifers. Human-caused effects on groundwater quality can occur directly by the infiltration of compounds, or indirectly by alteration of flow or geochemical conditions. Groundwater chemistry may be influenced by irrigation water, wastewater from human activities, and by-products from industrial activities.

The regulatory setting for ground water resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

11.2 Environmental Setting/Affected Environment

11.2.1 Extended Study Area

11.2.1.1 Methodology

For the Extended Study Area, the existing groundwater quality conditions were evaluated using hydrologic regions as boundaries. There are 10 hydrologic regions in California; they consider varying climates, geography, and hydrology (See Figure 6-2 in Chapter 6 Surface Water Resources). These regions correspond to the state's major water drainage basins. Using the drainage basins as planning boundaries allows logical tracking of natural water runoff and accounting of surface and groundwater supplies. The CVP and SWP service areas of the Extended Study Area are located within nine of California's 10 hydrologic regions. San Luis Reservoir falls within the San Joaquin River hydrologic region.

<u>North Coast Hydrologic Region</u>

Overall, groundwater quality in the North Coast Hydrologic Region is very good. Groundwater quality problems in this region include contamination from seawater intrusion and nitrates in shallow coastal groundwater aquifers; high total dissolved solids (TDS) and alkalinity in groundwater associated with the lake sediments of the Modoc Plateau basins; and iron, boron, and manganese in the inland groundwater basins of Mendocino and Sonoma counties. Septic tank failures in western Sonoma County, at Monte Rio and Camp Meeker, and along the Trinity River downstream of Lewiston Dam, are a concern because of potential impacts to groundwater wells and recreational water quality (DWR, 2005).

From 1994 through 2000, samples were taken from 584 public supply wells in 32 of the 63 basins and subbasins in this region. Of these wells, 95 percent met the state primary MCLs for drinking water, and the remaining five percent of wells sampled exceeded one or more MCL (DWR, 2003).

San Francisco Bay Hydrologic Region

Groundwater quality throughout much of the San Francisco Bay Hydrologic Region is of good quality and suitable for most urban and agricultural uses with only local impairments, such as leaking underground storage tanks. Primary constituents of concern are high TDS, nitrate, boron, and organic compounds. The areas of high TDS (and chloride) concentrations are typically found in the region's groundwater basins that are situated close to the San Francisco Bay, such as the northern Santa Clara, southern Sonoma, Petaluma, and Napa valleys. Elevated levels of nitrate have been detected in a large percentage of private wells tested within the Coyote Subbasin and Llagas Subbasin of the Gilroy-Hollister Valley Groundwater Basin (in the Central Coast Hydrologic Region,) located to the south of the Santa Clara Valley (SCVWD, 2001). The shallow aquifer zone within the Petaluma Valley also shows persistent nitrate contamination. Groundwater with high TDS, iron, and boron levels were present in the Calistoga area of Napa Valley, and elevated boron levels in other parts of Napa Valley make the water unfit for agricultural uses. Releases of fuel hydrocarbons from leaking underground storage tanks and spills/leaks of organic solvents at industrial sites have caused minor to significant groundwater impacts in many basins throughout the region. Methyl tertiary-butyl ether (MTBE) and chlorinated solvent releases to soil and groundwater continue to be problems (DWR, 2003).

From 1994 through 2000, samples were taken from 485 public supply water wells in 18 of the 33 basins and subbasins in this region. Analyzed samples indicate that 410 wells, or 85 percent, met the state primary MCLs for drinking water standards, and 75 wells, or 15 percent, have constituents that exceed one or more MCL (DWR, 2003).

Central Coast Hydrologic Region

Much of the groundwater in the Central Coast Hydrologic Region is impaired due to high mineralization. It is characterized by calcium sulfate to calcium sodium bicarbonate sulfate water types resulting from marine sedimentary rock in the watersheds. Water character is determined from chemical analyses by the dominant positively charged cation (e.g., sodium, calcium, or magnesium) with the dominantly negatively charged anion (e.g., chloride, sulfate, or bicarbonate). Where dominant cations and anions are not present there may be a combination of several compositions. Water quality problems most frequently encountered in the Central Coastal Basin pertain to excessive salinity or hardness of local ground waters. In some of the coastal groundwater basins, groundwater is pumped at a higher rate than the underground supply is replenished, such that seawater has pushed into some coastal freshwater aquifers and is degrading groundwater quality. Aquifers intruded by seawater are typically characterized by sodium chloride to calcium chloride, and have chloride concentrations greater than 500 mg/L. Groundwater basins that are affected by salinity include the Hollister area, the Carrizo Plain, the Santa Maria and Cuyama valleys, San Antonio Creek Valley, portions of the Santa Ynez Valley, and the Goleta and Santa Barbara areas. In several areas, groundwater exceeds the MCL for nitrate.

In the southern portion of Santa Clara County, elevated concentrations of nitrate and perchlorate have been detected. In late 2002, perchlorate emerged as a significant groundwater contaminant in the southern end of Santa Clara County. The known extent of this groundwater chemical plume extends 10 miles, and more than 800 water supply wells have been affected (DWR, 2005).

From 1994 through 2000, samples were taken from 711 public supply water wells in 38 of the 60 basins and subbasins in this region. Analyzed samples indicate that 587 wells, or 83 percent, met the state primary MCLs for drinking water, and 124 wells, or 17 percent, have constituents that exceed one or more MCL (DWR, 2003).

South Coast Hydrologic Region

The South Coast Hydrologic Region is divided into three subregions: Los Angeles, Santa Ana and San Diego. Groundwater in basins of the Los Angeles subregion is mainly calcium sulfate and calcium bicarbonate in character. Nitrate content is elevated in some parts of the subregion. Volatile organic compounds (VOCs) have created groundwater impairments in some of the industrialized portions of the region. The San Gabriel Valley and San Fernando Valley groundwater basins both have multiple sites of contamination from VOCs. The main constituents in the contamination plumes are trichloroethylene (TCE) and tetrachloroethylene (PCE). Some of the locations have been declared federal Superfund sites. Contamination plumes containing high concentrations of TCE and PCE also occur in the Bunker Hill Subbasin of the Upper Santa Ana Valley Groundwater Basin. Some of these plumes are also designated as Superfund sites. Perchlorate is emerging as an important contaminant in several areas in this region.

Groundwater in basins of the Santa Ana subregion is primarily calcium and sodium bicarbonate in character. Local impairments from excess nitrate or VOCs have been recognized. Groundwater and surface water in the Chino Subbasin of the Santa Ana River Valley Groundwater Basin have elevated nitrate concentrations, partly derived from a large dairy industry in that area. In Orange County, water from the Santa Ana River provides a large part of the groundwater replenishment. The primary groundwater character in the San Diego subregion includes a combination of calcium and/or sodium cation, and bicarbonate and/or sulfate anions. Localized groundwater quality impairments by nitrate, sulfate, and TDS are found in this subregion. Camp Pendleton Marine Base, in the northwestern part of this subregion, is on the USEPA National Priorities List for soil and groundwater contamination by many constituents.

From 1994 through 2000, samples were taken from 2,342 public supply water wells in 47 of the 73 basins and subbasins in this region. Analyzed samples indicate that 1,360 wells, or 58 percent, met the state primary MCLs for drinking water, and 982 wells, or 42 percent, have constituents that exceed one or more MCL (DWR, 2003).

Sacramento River Hydrologic Region

Overall, groundwater quality in the Sacramento River Hydrologic Region is good, although there are local groundwater quality impairments. Natural water quality impairments occur at the northern end of the Sacramento Valley in the Redding subbasin, and along the margins of the valley and around the Sutter Buttes, where Cretaceous age marine sedimentary rocks containing brackish to saline water are near the surface. Groundwater near the Sutter Buttes is impaired because of local volcanic geology, and hydrogen sulfide is a problem in wells in the geothermal areas in the western part of the region. Human-induced impairments are usually associated with individual septic system development in shallow unconfined portions of aquifers, or in fractured hard rock areas where insufficient soil depths are available to properly leach effluent before it reaches the local groundwater supply. Some groundwater sources in this region do not meet State secondary MCLs for iron and manganese, and heavy metals from historical burn dumps also contaminate groundwater locally. In the Sierra foothills there is potential for encountering uranium and radon-bearing rock or sulfide mineral deposits containing heavy metals. Perchlorate, previously used as an oxidizer or booster for solid rocket fuel and now a human health concern in domestic water, has contaminated wells in Rancho Cordova, near Sacramento (DWR, 2005).

In the mountainous portions of this region, groundwater is of fairly good quality, but it may be contaminated by naturally occurring radon, uranium, or sulfide mineral deposits containing heavy metals. In particular, radon contamination is associated with granite, such as the granite batholith of the Sierra Nevada. Some groundwater sources do not meet State secondary MCLs for iron and magnesium. Also, because of the lack of community wastewater systems, individual septic tanks are prevalent for rural residential development in this region. The failure of septic tank systems can create sewage flows that have the potential to adversely affect nearby wells and groundwater quality.

From 1994 through 2000, samples were taken from 1,356 public supply water wells in 51 of the 88 basins and subbasins in the Sacramento River HR. Samples analyzed indicate that 1,282 wells, or 95 percent, met the state primary MCLs for drinking water, and 74 wells, or five percent, have constituents that exceed one or more MCL (DWR, 2003).

San Joaquin River Hydrologic Region

Groundwater quality throughout the San Joaquin River Hydrologic Region is adequate for most urban and agricultural uses. However, there are approximately 1,000 square miles overlying groundwater along the western edge of the valley floor that are contaminated with high salinity from naturally occurring marine sediments of the Coast Range. The salinity of groundwater in the region can increase as a result of agricultural practices in which the evapotranspiration of crops and wetlands leaves behind the majority of salts contained in the imported water (either imported surface water or groundwater). In addition, high water-table conditions underlying marginal lands along the west side of the San Joaquin River region contribute to subsurface drainage problems. To maintain a salt balance in the root zone, much of this salt is leached into the groundwater.

Nitrates that are generated from the disposal of human and animal wastes, or from the inefficient application of fertilizer and irrigation water, have contaminated 200 square miles of groundwater in the region, and threaten some domestic water supplies. Pesticides have contaminated 500 square miles of groundwater basins, primarily in agricultural areas on the east side of the San Joaquin Valley, where soil permeability is higher and the depth to groundwater is shallower. The entire Central Valley has approximately 500,000 single-family residential septic systems, each with leach fields that discharge to the groundwater. The most notable agricultural contaminant detected in groundwater samples from this region is dibromochloropropane (DBCP), which is a banned nematode pesticide that has been found mostly along the SR 99 corridor. There are also approximately 200 square miles of groundwater basins that are contaminated by naturally occurring selenium (DWR, 2005).

In the mountainous portions of this region, groundwater is of good quality, but it may be contaminated by naturally occurring radon, uranium, or sulfide mineral deposits containing heavy metals. In particular, radon contamination is associated with granite, such as the granite batholith of the Sierra Nevada. Some groundwater sources do not meet State secondary standards for both iron and magnesium. Also, because of the lack of community wastewater systems, individual septic tanks are prevalent for rural residential development in this region and have the potential to adversely affect nearby wells and groundwater quality.

From 1994 through 2000, samples were taken from 689 public supply water wells in 10 of the 11 basins and subbasins in this region. Samples analyzed indicate that 523 wells, or 76 percent, met the state primary MCLs for drinking water, and 166 wells, or 24 percent, have constituents that exceed one or more MCL (DWR, 2003).

Tulare Lake Hydrologic Region

Groundwater quality in the Tulare Lake Hydrologic Region is suitable for most beneficial uses; however, there are several areas with impairments to groundwater. On the region's west side, salinity, sulfate, boron, chloride, and selenium limit the uses of groundwater. Salinity is the primary water quality factor affecting use of groundwater for irrigation and native habitat. Where groundwater quality is marginal to unusable for agriculture, farmers use good quality surface water to irrigate crops or blend higher quality surface water with poor quality groundwater to create a larger supply. The inefficiency of some crop irrigation systems can increase percolation of irrigation water into the shallow unconfined aquifers, causing drainage problems and degrading groundwater quality. This marginal to poor quality groundwater has mounded up to reach crop root zones in that area and is threatens the viability of agriculture there.

Agricultural runoff and drainage are also the main sources of nitrate, pesticides, and selenium that endanger groundwater and surface water beneficial uses. The basin also has a relatively large concentration of dairies that contribute microbes, salinity, and nutrients to both surface water and groundwater.

Nitrate has contaminated more than 400 square miles of groundwater in the Tulare Lake Basin. In addition, oilfield waste has affected water quality. There are more than 800 oilfield waste dischargers, of which 250 are regulated pursuant to waste discharge requirements (CVRWQCB, 2002).

Naturally occurring arsenic, as well as pesticides and industrial chemicals, have contaminated some groundwater supplies that are used for domestic water in the region. With newer federal and State drinking water rules being implemented over the past few years, numerous community domestic water well sources are noncompliant and have had to implement treatment methods or plans to reduce arsenic levels in drinking water. The contamination of almost 50 wells in Fresno/Clovis area due to high levels of DBCP and/or TCE, and other organic compounds resulted in the installation of activated charcoal filtration systems to remove these contaminants from the well water.

For many years, portions of the Tulare Lake region have experienced significant drainage problems, exacerbated by the fact that it is a basin with no significant water outflow to remove salts. The poorly drained area is concentrated along the western side of the San Joaquin Valley from Kern County north into the San Joaquin River Hydrologic Region. Although the San Joaquin Valley has some of the most productive agricultural lands in the world, much of the west side of the valley is plagued by poor subsurface drainage that adversely affects crop productivity. Between 1977 and 1991, the area affected by saline shallow groundwater on the west side doubled to approximately 1,200 square miles. A substantial portion of the valley, approximately 4,000 square miles, is threatened by saline shallow groundwater resulting from the lack of proper drainage (DWR, 2005).

From 1994 through 2000, samples were taken from 1,476 public supply water wells in 14 of the 19 groundwater basins and subbasins in this region. Evaluation of analyzed samples shows that 1,049 of the wells, or 71 percent, met the state primary MCLs for drinking water, and 427 wells, or 29 percent, exceeded one or more MCL (DWR, 2003).

South Lahontan Hydrologic Region

Groundwater quality in the South Lahontan Hydrologic Region is of good quality, although there are local impairments. The chemical character of the groundwater varies throughout the region, but most often is of calcium- or sodium-bicarbonate. Near and beneath dry lakes, sodium chloride and sodium sulfate-chloride water is common. Groundwater near the edges of valleys contains lower TDS content than water beneath the central part of the valleys or near dry lakes where water pools and dissolved chemicals concentrate as water evaporates, and may percolate through soils into the groundwater. At the lower elevations in this region, groundwater can be degraded, both naturally from geothermal activity, and as a result of activities such as recreational uses and cattle grazing. Arsenic, a known human carcinogen, is a health concern in the basin, and therefore, in Los Angeles as well. The vast majority of public water supply wells do meet drinking water standards. However, in places where these standards are exceeded, it is most often because of elevated levels of TDS, fluoride, or boron. The USEPA lists 13 sites of contamination in this region. Several domestic water supply wells in the Barstow area have been closed due to historical contamination from industrial and domestic wastewater. Three military installations in the southwestern part of the region are on the federal Superfund National Priorities List because of volatile organic compounds and other hazardous contaminants. In addition, the PG&E chromium groundwater contamination site in Hinkley is also within this region (DWR, 2005).

From 1994 through 2000, samples were taken from 605 public supply water wells in 19 of the 77 basins and subbasins in this region. Analyzed samples indicate that 506 wells, or 84 percent, met the state primary MCLs for drinking water, and 99 wells, or 16 percent, have constituents that exceed one or more MCL (DWR, 2003).

Colorado River Hydrologic Region

The groundwater in the Colorado River Hydrologic Region is impaired in many cases primarily due to high mineral concentrations. The chemical character of groundwater in this region is variable. Cation concentration is dominated by sodium, with calcium common and magnesium appearing less often. Bicarbonate is usually the dominant anion, although sulfate and chloride waters are also common. In basins with closed drainages, water character often changes from calcium-sodium bicarbonate near the margins to sodium chloride or chloride-sulfate beneath a dry lake. It is not uncommon for concentrations of dissolved constituents to rise dramatically toward a dry lake where saturation of mineral salts is reached. An example of this is found in the Bristol Valley Groundwater Basin, where the mineral halite (sodium chloride) is formed and then mined by evaporation of groundwater in trenches in Bristol (dry) Lake. The TDS content of groundwater is high in many of the basins in this region. High fluoride content is common; sulfate content occasionally exceeds drinking water standards; and high nitrate content is common, especially in agricultural areas. Significant water quality concerns include nitrate pollution in Coachella Valley, Lucerne Valley, and Desert Hot Springs.

Two of the primary challenges in this region are overdraft in the Coachella Valley and leaking underground storage tanks. The USEPA has not yet placed any contamination sites in this region on the Superfund National Priorities List; however, one site is being considered because of high pesticide levels (DWR, 2005).

From 1994 through 2000, samples were taken from 314 public supply water wells in 23 of the 64 basins and subbasins in this region. Analyzed samples indicate that 270 wells, or 86 percent, met the state primary MCLs for drinking water standards, and 44 wells, or 14 percent, have constituents that exceed one or more MCL (DWR, 2003).

11.2.2 Secondary Study Area

11.2.2.1 Shasta Lake Area

The quality of water in underground basins and water-bearing soils is considered good throughout most of Shasta County. Little groundwater quality data are available from the vicinity of Shasta Lake because this area is not a designated groundwater basin. Potential hazards to groundwater quality involve nitrates and dissolved solids from agricultural and range practices, and septic tank failures. The ability of soils in Shasta County to support septic tanks and on-site wastewater treatment systems is for the most part severely limited, particularly on older valley terrace soils and certain loosely confined volcanic soils in the eastern portions of the county.

11.2.2.2 Sacramento River Downstream of Lake Shasta

The area of the Sacramento River downstream of Lake Shasta includes Keswick Reservoir, the RBPP, the Sutter Bypass, and the Yolo Bypass. In the Redding area downstream of Lake Shasta, groundwater composition varies. In some locations, it is characterized as magnesium-calcium bicarbonate and calcium-magnesium bicarbonate type water, some as magnesium-sodium bicarbonate and sodium-magnesium bicarbonate, some as sodium bicarbonate and sodium chloride type, and other areas as mixed cationic bicarbonate. TDS concentrations range from 70 to 360 mg/L (DWR, 2011a). Groundwater quality impairments include localized high boron, iron, manganese, and nitrate. High levels of total dissolved salts and chlorides are present in the lower Tehama and Tuscan formations. Sodium and boron is present at shallow depth where wells draw from the Chico Formation.

From the Shasta County line south, groundwater composition in the subbasins along the Sacramento River is characterized as calcium-magnesium bicarbonate and magnesium-calcium bicarbonate. TDS concentrations range from 120 to 558 mg/L (DWR, 2011a). Groundwater quality impairments are not widespread, are typically localized, and can include boron, chloride, high magnesium, TDS, calcium, and phosphorus. High nitrate concentrations have been noted in the Antelope area near Red Bluff (DWR, 1987) and in Chico (DWR, 1984). Also, in the Chico area, eight groundwater contamination plumes of PCE, trichloroethylene (TCE), pentachlorophenol (PCP), or chloroform were identified (DTSC, 2004).

The United States Geological Survey (USGS), in cooperation with the California State Water Resources Control Board (SWRCB), sampled 66 wells in 2007 to 2008 in the Shasta and Tehama County area as part of their Groundwater Ambient Monitoring and Assessment (GAMA) Program. The concentrations of most constituents detected in groundwater samples from these wells were below drinking water thresholds. Volatile organic compounds (VOC) and pesticides were detected in less than 25 percent of the samples, and were generally less than one hundredth of any health-based thresholds. N-nitrosodimethylamine (NDMA) was detected above the California Notification Level in one grid well. Concentrations of all nutrients and trace elements in samples from study unit wells were below the health based thresholds, with the exception of arsenic in three samples, which was above the California MCL A few samples contained iron, manganese, or pH at levels above the California secondary MCL or USEPA secondary MCL (USGS, 2009).

From Orland south, on the west side of the Sacramento River, calcium-magnesium bicarbonate and magnesium-calcium bicarbonate are the predominant groundwater types. Calcium bicarbonate waters occur locally from Orland to Artois, and near Stony Creek. Mixed character waters for different regions of the subbasin occur as follows: sodium bicarbonate waters from the Williams-Colusa area south to

Grimes; magnesium-sodium bicarbonate or sodium-magnesium bicarbonate waters near the Williams-Arbuckle area and locally near Zamora; and magnesium bicarbonate waters locally near Dunnigan. TDS values range from 120 to 1,220 mg/L, averaging 391 mg/L. Impairments in this range include high EC, TDS, nitrate; manganese impairments occur near Colusa. High TDS and boron occur near Knights Landing. High nitrates occur in Arbuckle, Knights Landing, and Willows. Localized areas have high manganese, fluoride, magnesium, sodium, iron, chloride, TDS, ammonia, and phosphorus (DWR, 2003).

In Sutter County, data collected by the California Department of Water Resources (DWR) from several wells indicate a TDS range of 133 to 1,660 mg/L. The primary groundwater chemistry in the subbasin is characterized by calcium, magnesium, sodium, chloride, sulfate and bicarbonate, which may occur in any combination. Groundwater containing calcium-magnesium bicarbonate or magnesium-calcium bicarbonate exists in the northwest portion of the subbasin. Some groundwater quality data collected indicates some wells drilled to various depths contain chemical elements and compounds in amounts that exceed drinking water quality safety and aesthetic standards. Groundwater quality impairments in some portions of the County have naturally occurring levels of minerals, which present some concerns (taste, economics) (DWR, 2003).

The USGS collected samples from 108 wells in Butte, Colusa, Glenn, Sutter, Tehama, Yolo, and Yuba counties as part of the GAMA program (it also covers portions east of the Sacramento River presented in the Feather River discussion in Section 11.2.2.5). Most constituents that were detected in groundwater samples were found at concentrations below drinking water thresholds. VOCs were detected in less than 33 percent of the wells, and pesticides and pesticide degredates in more than 50 percent of the wells. All detections of these constituents in samples from all wells of this study unit were below health-based thresholds. All detections of trace elements in samples from this study unit's wells were below health-based thresholds, with the exceptions of arsenic and boron. Arsenic concentrations were above the California MCL threshold in eight grid wells, and boron concentrations were above the California notification level in two wells. Although the USGS study was primarily designed to evaluate quality for drinking water wells, they did sample some other well types to add additional information to the study. Arsenic was detected above the California MCL in two of these wells, and arsenic, barium, boron, molybdenum, strontium, and vanadium were detected above health-based thresholds in a few rice irrigation wells; again these wells are not used to supply drinking water. Chloride and sulfate concentrations exceeded California secondary MCL thresholds in two wells and one well, respectively. Iron, manganese, and total dissolved solids concentrations were above the California secondary MCL thresholds in one, 12, and six wells, respectively. Nitrate (nitrite plus nitrate, as dissolved nitrogen) concentrations from two wells were above the California MCL (USGS, 2008).

South of Colusa County, the Sacramento River flows between Yolo and Solano counties to the west, and Sacramento County to the east. To the east, on the north side of the American River, the chemistry and quality of groundwater has been assessed for the American Basin. Many areas of good quality groundwater exist in the North American subbasin. In some portions of the basin, groundwater quality is marginal. The three major groundwater types are: magnesium-calcium bicarbonate or calcium-magnesium bicarbonate; magnesium-sodium bicarbonate or sodium-magnesium bicarbonate; and sodium-calcium bicarbonate or calcium-sodium bicarbonate (DWR, 1997).

Comparison of groundwater quality data with applicable water quality standards and guidelines for drinking and irrigation indicate elevated levels of some water quality parameters. This list includes TDS/specific conductance (measurements of dissolved substances in water), chloride, sodium, bicarbonate, boron, fluoride, nitrate, and iron, manganese. Arsenic may also be of concern in some locations within the subbasin (DWR, 1997).

High TDS levels exist in an area along the Sacramento River extending from Sacramento International Airport northward to the Bear River. The highest levels of TDS are found in an area extending just south of Nicholas to Verona, between Reclamation District 1001 and the Sutter Bypass. Some wells in this area have reported TDS concentrations exceeding 1,000 mg/L. This same area along the Sacramento River extending from Sacramento International Airport northward to the Bear River also contains high levels of chloride, sodium, bicarbonate, manganese, and arsenic. The groundwater in the southern part of the basin is characterized as of fairy good quality, low in disinfection by-product precursor materials, and moderate in mineral content, although some localized contamination issues exist.

Impairments include three sites within the subbasin with significant groundwater contamination issues: the former McClellan AFB, Union Pacific Railroad Rail Yard in Roseville, and the Aerojet Superfund Site. Although the Aerojet site is south of the North American subbasin, a contaminant plume (including TCE and PCE) extends north from Aerojet, under the American River, and into the North American subbasin as described in a 2000 study by Montgomery Watson (as cited in DWR, 2003). Other localized areas of contamination exist throughout the basin and are usually smaller in scope and extent of contamination (DWR, 2003).

On the south side of the American River, groundwater is typically characterized by calcium-magnesium bicarbonate or magnesium-calcium bicarbonate. Other minor groundwater types include sodium calcium bicarbonate or calcium sodium bicarbonate in the vicinity of Elk Grove, and a magnesium sodium bicarbonate or sodium magnesium bicarbonate near the confluence of the Sacramento and American rivers. TDS concentrations range from 24 to 581 mg/L, and average 221mg/L, based on 462 records from a 1991 report by Bertoldi and others (as cited in DWR, 2003).Impairments to the south of the American River include 7 sites within the subbasin with significant groundwater contamination have been identified in a 1997 report by Montgomery Watson (as cited in DWR, 2003). Included in the list are three USEPA Superfund sites: Aerojet, Mather Field, and the Sacramento Army Depot. Other sites are the Kiefer Boulevard Landfill, an abandoned PG&E site on Jiboom Street near Old Sacramento, and the Southern Pacific and Union Pacific rail yards in downtown Sacramento (DWR, 2003).

To the west of Sacramento County, groundwater in the Yolo region is characterized as a sodium magnesium, calcium magnesium, or magnesium bicarbonate type. The quality is considered well for both agricultural and municipal uses, even though the water is considered hard to very hard (typically over 180 mg/L $CaCO_3$). Selenium and boron are found in higher concentrations locally as noted in a 1985 report by KID. Evensong (as cited in DWR, 2003). TDS concentrations range from 107 to 1,300 mg/L, and average 574 mg/L noted in a 2000 report by California Department of Health Services (as cited in DWR, 2003). Localized impairments include elevated concentrations of boron (as high as two to three mg/L) in groundwater along Cache Creek and in the Cache Creek Settling Basin area (DWR, 2003). Woodland has experienced nitrate contamination in certain wells. The City of Davis has experienced selenium contamination and localized areas of nitrate contamination. The Central Valley Regional Water Quality Control Board reported several sites in Davis, Woodland, West Sacramento, and Dunnigan with MTBE contamination (YCFCWCD, 2000).

Groundwater within the Solano subbasin is considered to be of fairly good quality, and useable for beneficial uses. Groundwater characterization is primarily magnesium bicarbonate in the central and northern areas, sodium bicarbonate in the southern and eastern areas, and calcium magnesium or magnesium calcium bicarbonate around and west of Dixon. TDS values range from between 250 and 500 mg/L in the northwest and eastern portion of the basin, and are found at levels higher than 500 mg/L in the central and southern areas. Data from DHS show the TDS minimum of 150, maximum 880, and average of 427 mg/L. In general, most of the water within the subbasin is classified as hard to very hard. Chloride concentrations are found over 100 mg/L in the southern areas, while sulfate concentration is greater than 50 mg/L in the southern areas. Boron concentrations are less than 0.75 mg/L, except in the southern and southeastern basin where concentrations average between 0.75 and 2.0 mg/L. Iron concentrations increase toward the eastern side of the subbasin, from less than 0.02 mg/L to greater than 0.05 mg/L along the Sacramento River, and manganese concentrations also increase from west to east with concentrations from .01 to over 0.1 mg/L found north of Rio Vista and east of the Solano-Yolo County line. Groundwater in this area is rather hard. High concentrations of bicarbonate, which cause precipitation of Ca and Mg carbonates, are found in the southern portion of the basin. Other impairments to groundwater include arsenic, where concentrations are typically between 0.02 and 0.05 mg/L, with the highest concentrations found along the southeastern margin of the basin, and manganese, which is found at concentrations above the MCL of 0.05 mg/L along the Sacramento River along the eastern portion of the subbasin (DWR, 2003).

Groundwater quality within the Capay Valley Subbasin is derived almost exclusively from Cache Creek and its tributaries. Consequently, water quality samples taken from Cache Creek within the Capay Valley reflect the quality of the water within the groundwater basin. Water samples taken from a diversion dam near the lower end of the Capay Valley indicate principally good quality calcium-sodium bicarbonate-type with moderate to very high hardness. Highly mineralized water from Bear Creek and North Fork Cache Creek is a primary source of mineral constituents, especially boron, in groundwater in the Capay Valley Subbasin. Total dissolved solids measured in water taken from six wells in the Capay Valley range from approximately 300 to 500 mg/l, and are comparable to those found in water samples taken from Cache Creek (DWR, 2003).

11.2.2.3 Whiskeytown Area

The Whiskeytown area includes Whiskeytown Lake, Clear Creek, and Spring Creek. Little information is available from the mountainous portions of the Clear Creek and Spring Creek watersheds regarding groundwater quality because these creeks are not located within a defined groundwater basin, and as such, have not been assessed. Most groundwater in this area is high in iron and aluminum due to the minerals in the rock (NPS, 2004).

After Clear Creek enters the valley floor, it enters the Redding Groundwater Basin and Anderson Subbasin. Groundwater in the subbasin is characterized as magnesium-sodium bicarbonate and sodium-magnesium bicarbonate type waters. TDS concentrations range from 109 to 320 mg/L, averaging 194 mg/L. Localized areas with high iron, manganese, and nitrate occur in the subbasin (DWR, 2003).

11.2.2.4 Trinity River Watershed

The Trinity River watershed includes Trinity Lake, the Trinity River, Lewiston Lake, and the Klamath River downstream of the Trinity River. Nearly the entire length of the Trinity River watershed is outside of defined groundwater basins. Therefore, groundwater quality information is sparse. Septic tank failures along the Trinity River downstream from Lewiston Dam are a concern because of potential impacts to groundwater wells and recreational water quality (DWR, 2005).

In the Hoopa area, groundwater is predominantly calcium-magnesium bicarbonate in character. TDS concentrations range from 95 to 159 mg/L, and average 125 mg/L. The primary groundwater quality impairments in the basin are locally high iron concentrations, and low pH values (most ranging from 6.1 to 6.9) (DWR, 2011a).

In the Lower Klamath River Valley area, groundwater is predominantly calcium bicarbonate. TDS concentrations range from 49 to 508 mg/L, and average 196 mg/L. Localized areas with high aluminum, iron, manganese, and TDS occur in the basin (DWR, 2011a).

11.2.2.5 Feather River Area

The Feather River area includes Lake Oroville, the Feather River, and the Thermalito Complex. Groundwater in the area of the Feather River downstream of Lake Oroville, as it flows through Butte County, is predominantly calcium-magnesium bicarbonate and magnesium-calcium bicarbonate waters in the Sacramento River Hydrologic Region. Magnesium bicarbonate waters occur locally near the Biggs-Gridley area, south and east to the Feather River. TDS concentrations range from 75 to 801 mg/L, averaging 235 mg/L (DWR, 2004). Localized high concentrations of manganese, iron, magnesium, TDS, specific conductance, and calcium occur in this area (DWR, 2003).

As the Feather River flows through Yuba County, the good groundwater quality characteristics are apparent in the overall salinity of groundwater in the Secondary Study area. TDS concentrations in the area are typically below 500 mg/L throughout the entire basin. Data collected from wells indicate a TDS concentration range of 141 to 686 mg/L. The primary water chemistry in the area indicates calcium-magnesium bicarbonate or magnesium-calcium bicarbonate groundwater. Some magnesium bicarbonate exists in the northwest portion of the basin (DWR, 2003).

In the Sutter County area, the region includes both the Feather and Sacramento rivers as they near their confluence. Therefore, groundwater quality co increased levels of selenium present in the groundwater supplies for the City of Davis, conditions are similar to those discussed in the appropriate areas for the Sacramento River downstream of Lake Shasta (Section 11.2.2.2).

Also, the USGS did some water quality sampling in this area for the GAMA Program, as discussed previously in Section 11.2.2.2 (Sacramento River Downstream of Lake Shasta), because their sampling encompassed the entire mid portion of the Sacramento Valley.

11.2.2.6 American River Area

The American River area includes Folsom Lake, the American River, and Lake Natoma. In the area near Sacramento, the region includes both the American and Sacramento rivers as they near their confluence. Therefore, groundwater quality conditions are similar to those discussed in the appropriate areas for the Sacramento River downstream of Lake Shasta (Section 11.2.2.2).

11.2.2.7 Delta Region

The Delta region includes the Sacramento-San Joaquin Delta and Suisun Bay. Groundwater quality throughout most of the Delta region is suitable for some urban and agricultural uses, with only local impairments. The character of the groundwater varies in different portions of the Delta. The primary constituents of concern are high TDS, nitrate, boron, chloride, and organic compounds. Other constituents that may have local impairments include arsenic and manganese. As a result of declining water levels, poor quality water has been moving to the east in the Stockton area. Projections indicate that a saline front is moving to the east approximately 150 to 250 feet per year. Groundwater extraction in the Eastern San Joaquin Subbasin has increased the flow of saline water from the west. There is a concern that the eastward migration of saltwater will degrade portions of the basin, rendering the groundwater unsuitable for urban and agricultural purposes (SJCPWD, 2004).

11.2.2.8 San Francisco Bay Area

The San Francisco Bay area includes San Pablo Bay and San Francisco Bay. Groundwater quality throughout most of the region is suitable for urban and agricultural uses, with only local impairments, such as leaking underground storage tanks. Groundwater in the Livermore Valley and Niles Cone (southern Alameda County) basins has high levels of TDS, chloride, boron, and hardness, such that both Alameda County Flood Control and Water Conservation District-Zone 7 and Alameda County Water District (ACWD) are implementing wellhead demineralization projects to improve the quality of this groundwater supply. In the Santa Clara Valley region, some of the underlying groundwater supplies are threatened by pollutants from various industrial activities and historical agriculture. The Santa Clara Valley Water District (SCVWD) works to protect the quality of these supplies by aggressively responding to pollution threats, such as MTBE, PCE, TCE, and perchlorate. These pollution threats are individually identified and evaluated to prevent or mitigate for groundwater contamination. Elsewhere, groundwater in Petaluma Valley and the Gilroy-Hollister Valley has high levels of nitrate, which adversely impacts the ability to use domestic wells for drinking water purposes. Groundwater recharge projects and the use of imported water have effectively halted land subsidence in most areas, and have successfully stopped or reversed seawater intrusion into aquifers around the bay (DWR, 2005).

11.2.3 Primary Study Area

11.2.3.1 Sites Reservoir, Dams, and Recreation Areas

Groundwater quality data for the proposed Sites Reservoir area are limited[1]. Fifteen wells within the proposed Sites Reservoir footprint were sampled in 2005. Groundwater quality in the proposed Sites Reservoir footprint and adjacent area was fair, but high in mineral content. Salinity, measured as specific conductance, ranged from 680 to 2,190 μmhos/cm, and TDS values ranged from 375 to 1,291 mg/L. Sampling revealed that no Primary MCLs were exceeded. Of the 15 wells sampled, Secondary MCLs were exceeded for TDS in 14 wells, specific conductance in 12 wells, sulfate in four wells, pH in three wells, manganese and iron in two wells, and aluminum and chloride in one well each. Agricultural Water Quality Goals from the Food and Agriculture Organization of the United Nations (CVRWQCB, 2011) were exceeded for specific conductance and TDS in 14 wells each, sodium in 13 wells, chloride in eight wells, boron in six wells, pH in three wells, and selenium in one well (Appendix 11A).

11.2.3.2 Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

In the area of the proposed Holthouse Reservoir Electrical Switchyard and the Holthouse Reservoir Complex, which includes the existing Funks Reservoir, there are few wells. One well could be sampled that was near this area. Water from this well was extremely high in mineral content; for example, the specific conductance for this well was 38,200 μmhos/cm, and the TDS concentration was 27,400 mg/L.

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[1] There are a limited number of well logs for wells in the proposed Sites Reservoir area. Several of these wells were not in use or were otherwise unable to be sampled. There are also several wells in this area for which no well log was available. Two of these wells were sampled to provide data in areas where no other wells were located and where adequate well construction data were provided by the owner/ranch manager.

The Primary MCL for arsenic was exceeded. Secondary MCLs were exceeded for chloride, specific conductance, manganese, and TDS Agricultural Water Quality Goals were exceeded for boron, chloride, and manganese (Appendix 11A).

11.2.3.3 Glenn-Colusa Irrigation District Canal

Groundwater data from 19 wells in the vicinity of the GCID Canal indicate good quality groundwater in this area. Impairments were not noted to be extensive, but some groundwaters had high mineral content. Specific conductance values ranged from 223 to 1,074 µmhos/cm, and TDS values ranged from 120 to 649 mg/L. Primary MCLs exceeded were for nitrite plus nitrate in two wells, and arsenic in one well. Secondary MCLs were exceeded for iron in four wells, TDS in three wells, and. aluminum and specific conductance in two wells each. Agricultural Water Quality Goals were exceeded for specific conductance in eight wells, TDS in five wells, sodium in six wells, and copper in one well (DWR, 2007).

11.2.3.4 Tehama-Colusa Canal

Groundwater data from 58 wells sampled along the length of the T-C Canal indicate that the quality of the groundwater along the canal is good, with a few impairments. Specific conductance ranged from 138 to 986 µmhos/cm, and TDS values ranged from 112 to 520 mg/L. Nitrate values exceeded the Primary MCL from one well. Secondary MCLs were exceeded for specific conductance, iron, and TDS in three wells each, and pH in one well. Agricultural Water Quality Goals were exceeded for specific conductance in five wells, boron and TDS in three wells each, copper and sodium in two wells each, and pH in one well (DWR, 2007).

11.2.3.5 Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Transmission Line, and Delevan Pipeline Electrical Switchyard

Data from 19 wells in the vicinity of the Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Transmission Line, and Delevan Pipeline Electrical Switchyard locations indicate that groundwater quality in this area is good; however, there are some impairments. This area had groundwater with a high mineral content, but concentrations were lower in proximity to the Sacramento River. Specific conductance values ranged from 324 to 2,245 µmhos/cm, and TDS ranged from 204 to 1,324 mg/L. The Primary MCL for arsenic was exceeded in four wells. Secondary MCLs were exceeded for manganese and specific conductance in nine wells each, TDS in eight wells, iron in five wells, and aluminum and sulfate in one well each. Recommended Agricultural Water Quality Limits were exceeded for sodium in 12 wells, specific conductance in 11 wells, TDS in nine wells, chloride and manganese in three wells each, and iron in one well (DWR, 2007).

11.2.3.6 Terminal Regulating Reservoir, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, and Terminal Regulating Reservoir Electrical Switchyard

Data from four wells near the locations of the proposed TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, and the TRR Electrical Switchyard indicate that groundwater quality in this area is fairly good, but high in mineral content. Specific conductance values ranged from 444 to 1,104 µmhos/cm, and TDS ranged from 259 to 608 mg/L. No Primary MCLs were exceeded. Secondary MCLs were exceeded for specific conductance and TDS in two wells each. Agricultural Water Quality

Limits were exceeded for sodium in three wells, specific conductance and TDS in two wells each, and chloride in one well (DWR, 2007).

11.2.3.7 Delevan Pipeline Intake/Discharge Facilities

Data from nine wells near the proposed Delevan Pipeline Intake/Discharge Facilities location indicate that groundwater quality is good, but high in mineral content. Specific conductance values ranged from 324 to 1,090 µmhos/cm, and TDS ranged from 204 to 622 mg/L. The Primary MCL for arsenic was exceeded in one well. Secondary MCLs were exceeded for manganese in six wells, specific conductance and iron in three wells each, and TDS in 2 wells. Recommended Agricultural Water Quality Limits were exceeded for specific conductance, sodium, and TDS in three wells each; manganese in two wells; and for arsenic, chloride and iron in one well each (DWR, 2007).

11.2.3.8 Road Relocations, South Bridge, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

Data from 21 wells near the locations of the proposed Road Relocations, South Bridge, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard were reviewed for groundwater quality in this area. The groundwater quality is fairly good, but impaired somewhat by high mineral content. Specific conductance values ranged from 290 to 2,190 µmhos/cm with 1 well at 38,200 µmhos/cm, and TDS ranged from 169 to 1,291 mg/L with 1 well at 27,400 mg/L. The Primary MCL for arsenic was exceeded from one well. Secondary MCLs were exceeded for TDS in 15 wells, specific conductance in 13 wells, manganese, pH, and sulfate each in three wells, and chloride and iron each in two wells. Agricultural Water Quality Goals were exceeded for specific conductance, sodium, and TDS in 14 wells each, chloride in eight wells, boron in six wells, pH in three wells, and selenium in one well (DWR, 2007).

11.2.3.9 Project Buffer

The Project Buffer would surround groupings of Project facilities. Groundwater quality within the Project Buffer would, therefore, be the same as described for each of the Project facilities that are surrounded by the Project Buffer.

11.3 Environmental Impacts/Environmental Consequences

11.3.1 Regulatory Setting

Groundwater quality is regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

11.3.1.1 Federal Plans, Policies, and Regulations

- Federal Safe Drinking Water Act
- Clean Water Act
- Federal Antidegradation Policy
- Porter-Cologne Water Quality Control Act

11.3.1.2 State Plans, Policies, and Regulations

- California Antidegradation Policy
- Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region
- Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
- Water Quality Control Plan for the Tulare Lake Basin
- Water Quality Control Plan for the North Coast Region

11.3.1.3 Water Quality Control Plan (Basin Plan)for the Sacramento/San Joaquin River Basins

- San Francisco Bay Basin Water Quality Control Plan
- California Code of Regulations – Underground Storage Tanks and Oil or Gas Wells

11.3.1.4 Regional and Local Plans, Policies, and Regulations

- Colusa County General Plan
- Glenn County General Plan
- Colusa County Groundwater Management Plan
- Glenn County Groundwater Ordinance and Management Plan

11.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for hydrology and water quality (no criteria are specifically directed at groundwater quality):

Would the Project:

- Violate any water quality standards or waste discharge requirements?
- Otherwise substantially degrade water quality?

These evaluation criteria used for this impact analysis represent a combination of Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact to groundwater quality if it would result in any of the following:

- A violation of any water quality standards or waste discharge requirements, a change in groundwater quality resulting in adverse effects to designated beneficial uses of groundwater, or otherwise substantially degrade groundwater quality

11.3.3 Impact Assessment Assumptions and Methodology

11.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to groundwater quality:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.

11.3.3.2 Methodology

A combination of data, published reports, modeling results, and professional experience with activities similar to those proposed was used to evaluate the potential impacts to groundwater quality from the alternatives. The data (detailed below) were used to assess existing groundwater quality and anticipate potential impacts that could result from Project-related activities in the three study areas.

The Extended and Secondary study area impact assessments relied on hydrologic and operational modeling performed using CALSIM II, which provided monthly river flows, and reservoir water surface elevations derived from monthly river flows and end-of-month reservoir storages, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). Detailed discussion of the CALSIM II model is provided in Appendix 6B. These modeling results were used in combination with professional judgment to assess the potential impacts of operation of the alternatives on groundwater quality.

DWR Bulletin 118-03 (DWR, 2003) was referenced to identify the groundwater basins within the Extended, Secondary, and Primary study areas, and to assess the groundwater quality within those basins from earlier assessments. In addition, DWR groundwater monitoring data (DWR, 2011a) were reviewed for the Primary and Secondary study areas.

A survey of DWR well completion report records (DWR, 2011b) was conducted to determine the number and location of wells in the Primary Study Area.

Previously completed studies of potential project effects to groundwater quality, including an Oroville Facilities FERC Relicensing groundwater study, were evaluated to determine the type and severity of impacts that might result in the Primary Study Area from proposed Project-related activities. Worst-case specific conductance (EC) conditions were simulated to assess the surface water quality of the proposed Sites Reservoir (refer to Appendix 7C for a detailed description of the EC Mass Balance Approach and modeling results). Expected surface water quality conditions were then compared to existing groundwater quality conditions to determine if an adverse impact could occur.

11.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

11.3.5 Impacts Associated with the No Project/No Action Alternative

11.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Use

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to groundwater quality has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** to groundwater quality.

Groundwater extraction has exceeded groundwater recharge in several areas of the Sacramento and San Joaquin hydrologic regions. This has resulted in lower quality saline water infiltrating further into portions of the valley aquifer. Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Population growth and/or increased agricultural demands could result in increased use of groundwater resources, adding additional stress to existing aquifers which could negatively affect groundwater quality. Continued groundwater extraction at rates that exceed groundwater recharge **could have a substantial adverse effect** on groundwater quality, when compared to Existing Conditions.

San Luis Reservoir

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

With implementation of the No Project/No Action Alternative, San Luis Reservoir would continue to experience water level fluctuations similar to Existing Conditions. Groundwater quality would not be expected to be substantially adversely affected by continued fluctuations. Therefore, continued fluctuations in water levels at San Luis Reservoir **would not have a substantial adverse effect** on groundwater quality, when compared to Existing Conditions.

11.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

As explained for the Extended Study Area, the No Project/No Action Alternative includes projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to groundwater quality has been addressed in those environmental documents. However, population growth could result in increased use of existing aquifers, which could result in a decline in groundwater quality. Groundwater level data indicate that groundwater extraction has likely exceeded groundwater recharge in several areas of the Sacramento River Hydrologic Region. These areas are scattered throughout the region, but there are areas with higher groundwater overdraft rates in Glenn County and south of the city of Williams in Colusa County. These areas are located in the Sacramento Valley floor groundwater basins. If the No Project/No Action Alternative is implemented, the overdraft rates would likely continue and possibly increase. Continued groundwater extraction at rates that exceed groundwater recharge **could have a substantial adverse effect** on groundwater quality, when compared to Existing Conditions.

11.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Use

Projects included in the No Project/No Action Alternative are not located within the Primary Study Area, and therefore **would not have a substantial adverse effect** on Primary Study Area groundwater quality. With implementation of the No Project/No Action Alternative, local landowners and tenants would continue to use groundwater for domestic use, manage crops with irrigation and pesticides, and raise cattle, which could degrade local groundwater quality. Population growth is projected to be minimal in this area, and **would not have a substantial adverse effect** on groundwater quality due to the small actual increase to the local population in this area, when compared to Existing Conditions.

11.3.6 Impacts Associated with Alternative A

11.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Use

Because there would not be any Project-related construction work or maintenance activities in the Extended Study Area, there would be **no impact** to groundwater quality associated with these activities.

The provision of an alternate source of wildlife refuge water supply would not affect rates of groundwater use, and would, therefore, have **no impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation would have a beneficial, albeit limited, impact by increasing surface water supply reliability and consequently reducing reliance on groundwater in the CVP and SWP service areas within the Extended Study Area. Increased surface water supply reliability to agricultural, industrial, and municipal water users could result in decreased groundwater pumping. Decreased groundwater pumping would allow groundwater basins to recharge, resulting in improved groundwater quality. Additionally, irrigating with lower salinity water supplied from the Project, rather than groundwater, could alleviate existing increasing soil and groundwater salinity problems that result from evapotranspiration. Therefore, operational effects on groundwater quality within the Extended Study Area would be **potentially beneficial**, when compared to Existing Conditions and the No Project/No Action Alternative.

San Luis Reservoir

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that operation of the Project would result in continued water level fluctuations at San Luis Reservoir, but the fluctuations would occur more often and could be more severe. Severe reservoir level drawdowns could result in reduced seepage, which could reduce local groundwater quality. However, San Luis Reservoir currently experiences severe water level fluctuations, and historic groundwater quality ranges should not be substantially adversely affected by continued fluctuations at an increased rate. Therefore, the increased fluctuations in water levels at San Luis Reservoir would have a **less-than-significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

11.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Project operation would result in improved surface water storage in reservoir facilities within the Secondary Study Area, which could increase seepage and soil percolation that recharges groundwater in these areas. However, this is not expected to increase at a rate that would have a significant beneficial effect on groundwater quality. Changes to the flow regime of the rivers, creeks, and bypasses could result in changes in the rate of groundwater recharge, but the amount of change is likely to be proportional to the change in flow, which would vary throughout the system. These changes are not expected to substantially affect groundwater quality. Project diversions would not be expected to adversely affect groundwater recharge rates in areas where groundwater extraction has likely exceeded groundwater recharge because Project diversions would occur during periods of excess surface flows and storm events. Therefore, changes in reservoir storage and flow regime would have a **less-than-significant impact** on groundwater quality within the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

The installation, operation, and maintenance of an additional pump into an existing bay at the RBPP would have **no impact** on groundwater quality because it would neither extract groundwater nor increase groundwater recharge, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

The only direct Project-related maintenance activity that would occur within the Secondary Study Area is associated with the removal of sediment from the two existing canal intakes. This activity could result in the use of hazardous materials associated with heavy equipment. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. Contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

11.3.6.3 Primary Study Area – Alternative A

<u>Construction, Operation, and Maintenance Impacts</u>

Sites Reservoir Inundation Area

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

It is likely that, despite the grouting of the underlying rock formations, some water would leak from the reservoir and could increase groundwater recharge in nearby areas outside of the reservoir inundation area. Surface water quality modeling results indicate a worst-case long-term average EC of 190 to 192 µmhos/cm in Sites Reservoir (Appendix 7C), as compared to the range in EC of 680 to 2,190 µmhos/cm measured for existing groundwater quality conditions within the reservoir footprint. The weight of the reservoir could, therefore, force better quality surface water into the reservoir floor. There would also be additional percolation of surface water into the soils, and therefore, groundwater, beneath the reservoir. This surface water could beneficially alter shallow groundwater chemistry in and immediately around the reservoir. Therefore, reservoir inundation could have a potentially **beneficial effect** to shallow groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During construction in the Sites Reservoir Inundation Area it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There are approximately 26 wells and numerous septic systems located within the proposed reservoir inundation area. In addition to water wells, there may be current or historic oil and gas wells, test wells, and/or boreholes. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality, or the potential for groundwater to contaminate reservoir surface water after inundation. The possible contamination resulting from the improper abandonment and consequent inundation of these wells, boreholes, and septic systems would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

There are not expected to be any underground storage tanks within the reservoir inundation area. However, if any are identified they would need to be located and abandoned pursuant to appropriate codes and regulations.

Sites Reservoir Dams

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Sites and Golden Gate dams would be constructed on Stone Corral and Funks creeks, respectively; flows to those creeks would be maintained during construction. Some redirection of creek flows and stormwater management during construction may result in very minor redirection of groundwater recharge, but not at a rate that would be expected to affect groundwater quality. Following completion of construction, flows would be maintained downstream of the dams. Therefore, the temporary dewatering of Funks and Stone Corral creeks during dam construction would have a **less-than-significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During construction in the Sites Reservoir Dams, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. In addition, during construction, an on-site concrete batch plant may be required. Storage of materials for production of concrete, waste products from this production, or other forms of contamination from associated equipment and construction vehicles could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There may be water wells, septic systems, or current or historic oil and gas wells, test wells, or boreholes at the damsites. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any wells, boreholes, or septic systems would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Temporary dewatering of shallow groundwater may be required during construction. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface waters. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Hazardous Materials

During construction of the Recreation Areas, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. In addition, during operation and maintenance, increased vehicle traffic and use of the recreation areas by recreationists could introduce contaminants (such as fuels, oils, and herbicides) that could enter the environment and subsequently compromise groundwater quality. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There may be test wells or boreholes at the sites planned for Recreation Areas. All test wells and/or boreholes would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any test wells or boreholes would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Septic System, Leach Field, and Vault Toilet Construction

Vault toilets would be installed at all of the Recreation Areas. If they are improperly installed or not maintained correctly, they would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Hazardous Materials

During construction of the Road Relocations and South Bridge, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, on-site batch plants for asphalt or concrete may be required. Storage of materials for production of asphalt or concrete, waste products from this production, or other forms of contamination from associated equipment and construction vehicles could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation, vehicle traffic could have an adverse effect on groundwater quality resulting from spills or leaks. Runoff from materials used during road maintenance and repairs could also adversely affect groundwater quality. Careful management of ongoing road maintenance activities, together with habitat restoration and water quality pollution prevention projects in or adjacent to the road right-of-way, substantially contribute to the prevention of pollution. Combined, or individually, these would have a **less-than-significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There may be water wells, septic systems, or current or historic oil and gas wells, test wells, or boreholes along or adjacent to the road relocations. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any wells, boreholes, or septic systems could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Temporary dewatering of shallow groundwater may be required during construction. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface waters. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Hazardous Materials

During construction of these facilities, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There may be water wells, septic systems, or current or historic oil and gas wells, test wells, or boreholes along or adjacent to these facilities. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any wells, boreholes, or septic systems could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Construction of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard may require temporary localized lowering of the shallow groundwater. Construction of the tunnel from the Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure would require dewatering. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface water. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Septic System and Leach Field Construction

Leach fields and a water treatment facility would be installed at the Field Office Maintenance Yard. Septic systems and associated leach fields must be properly sited, designed, installed, operated, and maintained to avoid harmful contamination from wastewater. Improper construction of these systems could result in a **potentially significant impact** to groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

During the construction of Holthouse Reservoir, Funks Reservoir would be drained and dredged to design capacity. The reservoir would be drained for up to two years. During this time, groundwater quality may be adversely affected due to reduced seepage and percolation from the drained reservoir. Because this is a temporary activity, and soil permeability is low in the area, the impact to groundwater quality would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Inundation of Holthouse Reservoir would likely lead to higher groundwater levels in a localized area around the reservoir from reservoir leakage and soil percolation. Holthouse Reservoir surface water quality is assumed to be the same as that modeled for Sites Reservoir. Surface water quality modeling results indicate a worst-case long-term average EC of 190 to 192 µmhos/cm for Sites Reservoir (Appendix 7C), as compared to the EC value of 38,200 µmhos/cm measured for existing groundwater quality conditions in the vicinity of Funks Reservoir. Therefore, this would a **beneficial effect** because shallow groundwater quality would be improved with better quality reservoir water, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During the dredging of Funks Reservoir, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

During the construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There are approximately three wells within a one-mile radius of these facilities. There may also be septic systems, current or historic oil and gas wells, test wells, or boreholes along or adjacent to the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any wells, boreholes, or septic systems could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard may require temporary localized lowering of the shallow groundwater. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface water. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Inundation of the TRR would likely lead to higher groundwater levels in a localized area around the reservoir from reservoir leakage and soil percolation. TRR surface water quality is assumed to be the same as that modeled for Sites Reservoir. Surface water quality modeling results indicate a worst-case long-term average EC of 190 to 192 µmhos/cm in Sites Reservoir (Appendix 7C), as compared to the range in EC of 444 to 1,104 µmhos/cm measured for existing groundwater quality conditions in the vicinity of the proposed TRR. Therefore, this would have a **beneficial effect** because shallow groundwater quality would be improved with better quality reservoir water, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During the construction of the TRR and associated facilities, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

There are approximately 10 wells within a one-mile radius of the proposed TRR. There may also be septic systems, or current or historic oil and gas wells, test wells, or boreholes along or adjacent to these TRR facilities. All well types, boreholes, and septic systems would need to be located, identified, and properly abandoned before or during construction; otherwise, they have the potential of creating a conduit for significant contaminant impacts to groundwater quality. The possible contamination resulting from the improper abandonment of any wells, boreholes, or septic systems could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Construction of these TRR facilities may require temporary localized lowering of the shallow groundwater. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface waters. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Underground Utilities

The proposed TRR Pipeline route would cross an existing PG&E gas line. It is possible that other gas lines exist along the pipeline route. All underground utilities would need to be located prior to construction to ensure that no damage is incurred during construction of the pipeline. If gas lines are damaged, they could allow gas to leak into groundwater, which would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

A portion of the earthen channel of the GCID Canal would be dewatered while 200 feet of the canal are lined with concrete. However, this construction is expected to occur during the regularly scheduled annual maintenance period for the canal, and would, therefore, not be expected to adversely affect groundwater recharge or quality. Once the canal is lined, there could be a reduction in the localized rate of groundwater recharge. However, because only 200 feet of canal would be lined, the potential subsequent loss of recharge in that small area would have a **less-than-significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During modifications of the GCID Canal facilities, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Hazardous Materials

During construction of the Delevan Transmission Line, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline and Delevan Pipeline Electrical Switchyard

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Hazardous Materials

During construction of the Delevan Pipeline and Delevan Pipeline Electrical Switchyard, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Temporary dewatering of shallow groundwater may be required during construction of these facilities. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface water. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Underground Utilities

The Delevan Pipeline route would cross an existing PG&E gas line. It is possible that other gas lines exist along the pipeline route. All underground utilities need to be located prior to construction to ensure that no damage is incurred during construction of the pipeline. If gas lines are damaged, they could allow gas to leak into groundwater, which would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Temporary dewatering of shallow groundwater may be required during construction. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Additionally, water from dewatering operations would need to be stored and properly handled and disposed of to avoid potentially contaminating surface water. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality.

Filling of the intake forebay would likely lead to higher groundwater levels in a localized area around the forebay from leakage and soil percolation. Forebay surface water quality is assumed to be the same as that modeled for Sites Reservoir. Surface water quality modeling results indicate a worst-case long-term average EC of 190 to 192 µmhos/cm in Sites Reservoir(Appendix 7C), as compared to the range in EC of 324 to 1,090 µmhos/cm measured for existing groundwater quality conditions in the vicinity of the facilities footprint. This would be a **potentially beneficial effect** because shallow groundwater quality would be improved with better quality surface water, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During construction of the Delevan Pipeline Intake Facilities, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Dewatering

Construction of the Delevan Pipeline Intake Facilities would require dewatering of shallow groundwater. Dewatering could expose soils and shallow groundwater to contamination from stormwater, construction materials, wastes, or other spilled materials. Contamination as a result of dewatering could have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Existing structures within the Project Buffer would be demolished, and any agricultural fields that are currently irrigated would not continue to receive irrigation. Any wells associated with those structures or used as irrigation sources may, therefore, no longer be used. The discontinued use of any wells could increase groundwater recharge, resulting in a **less-than-significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Hazardous Materials

During demolition of structures that are located within the Project Buffer, it is possible that the operation and maintenance of construction equipment could result in hazardous materials spills. These materials could pose a significant risk if misused or improperly handled and stored. Leaks and spills could enter the soil and potentially contaminate groundwater. The potential contamination of groundwater from hazardous materials would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

11.3.7 Impacts Associated with Alternative B

11.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to groundwater quality (**Impact GW Qual-1**), would be the same as described for Alternative A for the Extended Study Area.

11.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to groundwater quality (**Impact GW Qual-1**), would be the same as described for Alternative A for the Secondary Study Area.

11.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater quality:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline

- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprint or construction disturbance area of Sites Reservoir and Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on groundwater quality (**Impact GW Qual-1**) as described for Alternative A, with the exclusion of the potential impacts associated with the Delevan Pipeline Intake Facility forebay and afterbay that are included in Alternative A, but not Alternative B.

The Sites Reservoir Inundation Area would increase from a 1.27-MAF capacity (with Alternative A) to a 1.81-MAF capacity (with Alternative B). The larger reservoir size associated with Alternative B would require the same type of construction, operation, and maintenance activities as for Alternative A, and would, therefore, have the same potential for impact from hazardous materials (**Impact GW Qual-1: Hazardous Materials**) as described for Alternative A. Potential impacts associated with a larger reservoir on rates of groundwater recharge and abandoned wells, septic systems, or underground storage tanks are described below.

Sites Reservoir Inundation Area

Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality

Changes in Rates of Groundwater Recharge

Refer to the **Impact GW Qual-1** discussion for the Alternative A Sites Reservoir Inundation Area. The greater volume of water in the Alternative B reservoir would not appreciably change the rate of groundwater forced into the soil from the weight of the reservoir water and from natural percolation from that described for Alternative A. It could, however, beneficially alter shallow groundwater chemistry in and immediately around the reservoir, as described for Alternative A. Therefore, the Sites Reservoir Inundation Area could have a **potentially beneficial effect** to shallow groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

Abandoned Wells, Septic Systems, or Underground Storage Tanks

Refer to the **Impact GW Qual-1** discussion for the Alternative A Sites Reservoir Inundation Area. It is possible that the larger reservoir would inundate additional wells, septic systems, boreholes, or underground storage tanks than Alternative A, but the number of potential additional wells associated with Alternative B would be small relative to the total number affected. Regardless of whether additional impacts would occur in comparison to Alternative A, the possible contamination resulting from the improper abandonment and consequent inundation of these wells, boreholes, and septic systems would have a **potentially significant impact** on groundwater quality, when compared to Existing Conditions and the No Project/No Action Alternative.

11.3.8 Impacts Associated with Alternative C

11.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to groundwater quality (**Impact GW Qual-1**), would be the same as described for Alternative A for the Extended Study Area.

11.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to groundwater quality (**Impact GW Qual-1**), would be the same as described for Alternative A for the Secondary Study Area.

11.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater quality:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater quality (**Impact GW Qual-1**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Facilities, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to groundwater quality (**Impact GW Qual-1**) as described for Alternative B.

The boundary of the Project Buffer would be the same for all alternatives, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on groundwater quality (**Impact GW Qual-1**) as described for Alternative A.

11.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 11-1 for the impacts that have been identified as significant or potentially significant.

Table 11-1
Summary of Mitigation Measures for
NODOS Project Impacts to Groundwater Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact GW Qual-1: A Violation of any Water Quality Standards or Waste Discharge Requirements, a Change in Groundwater Quality Resulting in Adverse Effects to Designated Beneficial Uses of Groundwater, or Otherwise Substantially Degrade Groundwater Quality				
Impact GW Qual-1a: Hazardous Materials	Sediment Removal at the T-C and GCID Canal Intakes; All Primary Study Area Project facilities	Potentially Significant	Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Impact GW Qual-1b: Abandoned Wells, Septic Systems, or Underground Storage Tanks	Sites Reservoir and Dams, Recreation Facilities, Road Relocations, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, TRR, TRR Pipeline, TRR Pumping/Generating Plant, TRR to Funks Creek Pipeline, GCID Connection to TRR	Potentially Significant	Mitigation Measure GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems	Less than Significant

Table 11-1
Summary of Mitigation Measures for
NODOS Project Impacts to Groundwater Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact GW Qual-1c: Dewatering	Sites Reservoir Dams, Road Relocations, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, TRR, TRR Pipeline, TRR Pumping/Generating Plant, TRR to Funks Creek Pipeline, GCID Connection to TRR, Delevan Pipeline, Delevan Pipeline Intake/Discharge Facilities	Potentially Significant	Mitigation Measure GW Qual-1c: Implement Caltrans Field Guide to Construction Site Dewatering	Less than Significant
Impact GW Qual-1d: Underground Utilities	TRR Pipeline, Delevan Pipeline	Potentially Significant	Mitigation Measure GW Qual-1d: Identify Underground Utilities Prior to Start of Construction	Less than Significant
Impact GW Qual-1e: Septic System, Leach Field, and Vault Toilet Construction	Recreation Facilities, Field Office Maintenance Yard	Potentially Significant	Mitigation Measure GW Qual-1e: Construct Septic Systems, Leach Fields, and Vault Toilets in Accordance with County Permit Specifications	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan

DWR and Reclamation shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that emphasizes proper hazardous materials storage and handling procedures; shall outline spill containment, cleanup, and reporting procedures; and shall limit refueling and other hazardous activities to designated areas. Signs prohibiting refueling shall be posted in sensitive areas. Equipment shall be inspected prior to use each day to ensure that hydraulic hoses are tight and in good condition. Other appropriate BMPs, such as use of concrete washout basins and proper waste management, securely locating and maintaining portable toilets, combined with visual observation and water sample collection and analysis, shall be used to prevent discharge of possible contaminants and chemicals associated with construction, maintenance, or operations activities to reduce potentially significant contamination impacts to groundwater quality to a **less-than-significant level**. Details of these BMPs are described in Section WM-4 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems

According to DWR's Water Well Standards (DWR, 2012), a well that is no longer useful (including exploration and test holes) must be destroyed to assure that the existing groundwater quality and proposed Project water quality is protected and preserved for further use, and to eliminate any potential physical hazard. Destruction of a well shall consist of the complete filling of the well in accordance with the procedures described in DWR Water Well Standards Section 23. Permits for well destruction shall also be obtained from the appropriate County agency (Glenn or Colusa).

Any current or historic oil and gas wells detected within the Project facility footprints shall be addressed. Any well types that would be inundated shall be properly sealed and abandoned according to policies and procedures laid out in the California Code of Regulations Title 14 from the Department of Conservation. These wells shall be sealed to ensure that the existing groundwater quality is protected and preserved, and to eliminate any potential physical hazard. Permits for well destruction shall also be obtained from the appropriate County agency (Glenn or Colusa).

Any test holes, boreholes, other potential conduits to groundwater shall also be sealed and destroyed.

Existing septic systems, such as septic tanks, cesspools, and seepage pits, shall be identified and located. These septic systems shall then be properly abandoned and demolished, and, if necessary, removed and disposed of. Destruction of septic systems shall require:

- A licensed septic tank pumper to pump the septic tank. A copy of the receipt for this pumping shall be obtained.
- Abandonment of the tank in accordance with county ordinances, which may include methods such as:
  - Tank removed, then disposed of at a sanitary landfill
  - Tank top removed, tank crushed, then excavation filled with earthen materials to within 12 inches of native surface
  - Tank top removed, bottom perforated, then excavation filled with earthen materials to within 12 inches of native surface

Permits for abandonment and destruction shall also be obtained from the appropriate County (Glenn or Colusa) prior to work.

Mitigation Measure GW Qual-1c: Implement Caltrans Field Guide to Construction Site Dewatering

Effluent from dewatering activities shall be properly stored and disposed of to prevent contamination of surface water. This BMP is intended to prevent the discharge of pollutants from construction site dewatering operations associated with stormwater (accumulated rain) and non-stormwater (e.g., groundwater or water from a diversion or cofferdam). Dewatering effluent that is discharged from the construction site to a storm drain or receiving water is subject to the requirements of the applicable National Pollutant Discharge Elimination System (NPDES) permit. Refer to the *Caltrans Field Guide to Construction Site Dewatering* for detailed guidance for management of dewatering operations (Caltrans, 2001). The dewatering effluent shall be managed according to Central Valley RWQCB requirements and California Stormwater Quality Association BMPs.

Mitigation Measure GW Qual-1d: Identify Underground Utilities Prior to Start of Construction

Underground utilities in the vicinity of Project facility footprints, such as gas or sewer lines, must be identified and located prior to any excavation. This is to ensure excavation activities do not cause damage to the utilities, resulting in utility disruption and/or construction worker safety. Prior to the start of construction, utility providers shall be contacted to identify underground utilities in the vicinity of Project facility footprints.

Mitigation Measure GW Qual-1e: Construct Septic Systems, Leach Fields, and Vault Toilets in Accordance with County Permit Specifications

Septic systems, leach fields, and vault toilets shall be properly sited, designed, installed, operated, and maintained to ensure that wastewater is adequately treated and does not contaminate groundwater. Permits and approvals shall be obtained from Colusa County Environmental Health.

Implementation of **Mitigation Measures SW Qual-1e, GW Qual-1b, GW Qual-1c, GW Qual-1d, and GW Qual-1e** would reduce the level of significance of Project impacts to groundwater quality to **less than significant**.

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12. Aquatic Biological Resources

12.1 Introduction

This chapter describes the aquatic habitat and fish resources found within the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Fish species of primary management concern include special-status species and species that have substantial commercial or recreation value. The biology and life history of these species are described in Appendix 12A.

The regulatory setting for aquatic biological resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas are evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives are described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

12.2 Environmental Setting/Affected Environment

12.2.1 Extended Study Area

12.2.1.1 Methodology

A county-level California Natural Diversity Database (CNDDB) (CDFG, 2009) search was conducted to determine the special-status fish species that may occur within the 39 counties included in the Extended Study Area. Documents specific to areas and species within the Extended Study Area were also reviewed to characterize aquatic biological resources.

12.2.1.2 Level 4 National Wildlife Refuges and Wildlife Areas

In addition to providing irrigation water to the Sacramento and San Joaquin valleys, and domestic water to cities and industries in Sacramento County and the east and south Bay areas, the CVP supplies water to wildlife refuges.

Fish species occur in the waterways that deliver CVP Level 4 wildlife refuge water supply[1] to the wetlands within the wildlife refuges. In the Sacramento River Basin, the refuges that receive Level 4 water include the Sacramento and Delevan national wildlife refuges (NWR). Waterways within these refuges include creeks, the Colusa Basin Drain (CBD), and many smaller water supply and drainage ditches. These waterways are part of the Sacramento River system. Most resident fish in the waterways that supply the refuge system are non-native warm-water species. Native anadromous fish include steelhead and four distinct runs of Chinook salmon.

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[1] The Level 4 water deliveries that could be affected by Project operation are contracted to The Sacramento and Delevan National Wildlife Refuges (NWR), the West Bear Creek unit of the San Luis NWR Complex and the Merced unit of the Merced NWR, as well as the Los Banos, Volta, and Mendota WAs, the China Island and Salt Slough units of the North Grasslands Wildlife Area, and private wetlands of the Grassland Resource Conservation District within the San Joaquin River Basin; and to the Kern and Pixley NWRs within the Tulare Lake Basin.

The waterways of the NWRs and Wildlife Areas (WAs) within the San Joaquin River Basin and Tulare Lake Basin that receive Level 4 water supply support warm-water resident fish species. Sensitive species are not known to occur within the San Joaquin River Basin and the Tulare Lake Basin NWRs and WAs within the Extended Study Area (Reclamation et al., 2001; USFWS, 2004). Fish species commonly found in the San Joaquin River Basin NWR water conveyance ditches and canals include spotted bass (*Micropterus punctulatus*), largemouth bass (*M. salmoides*), channel catfish (*Ictalurus punctatus*), sunfish (*Lepomis* sp.), brown bullhead (*Ameiurus nebulosus*), and common carp (*Cuprinus carpio*). Flooding may occur, but is much less frequent than in the Sacramento River Basin. Sacramento splittail (*Pogonichthys macrolepidotus*) may occur within the San Joaquin River Basin NWRs during periods of spring flooding or high flows. Spawning populations of fall-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley Steelhead (*Onchorynchus mykiss*), and lamprey (*Lampetra* sp.) are known to occur in the San Joaquin River Basin north and downstream of the NWRs (Reclamation et al., 2001). Fish passage upstream of the Merced River confluence is limited during the fall by a fish barrier that CDFG maintains in the San Joaquin River to prevent passage of adult fall-run Chinook salmon.

The fish species of primary management concern that may occur in the Extended Study Area are listed in Table 12-1.

Table 12-1
Fish Species of Primary Management Concern in the Extended Study Area

Common Name	Scientific Name	Listing Status Federal/State[a]
Central Valley Chinook salmon, winter-run[b]	*Oncorhynchus tshawytscha*	FE/SE
Central Valley Chinook salmon, spring-run[b]	*Onchorynchus tshawytscha*	FT/ST
Central Valley Chinook salmon, fall-/late fall-run	*Onchorynchus tshawytscha*	FSC/CSSC
Central Valley steelhead[b]	*Onchorynchus mykiss*	FT
Klamath Mountain Province ESU Steelhead	*Onchorynchus mykiss*	C
Central California Coast Steelhead	*Onchorynchus mykiss*	FT
South Central California Coast Steelhead	*Onchorynchus mykiss*	FT
Southern California Steelhead	*Onchorynchus mykiss*	FE
Coho Salmon Northern California/Southern Oregon ESU[c]	*Oncorhynchus kisutch*	FT
Central California Coast Coho Salmon ESU	*Oncorhynchus kisutch*	FE
Green sturgeon Southern DPS[d, b]	*Acipenser medirostris*	FT/CSSC
White sturgeon	*Acipenser transmontanus*	None
Delta smelt[b]	*Hypomesus transpacificus*	FT/ST
River lamprey	*Lampetra ayresi*	FSC/CSSC
Pacific lamprey	*Lampetra tridentata*	None
Sacramento splittail	*Pogonichthys macrolepidotus*	FT/CSSC
Hardhead	*Mylopharodon conocephalus*	CSSC
Longfin smelt	*Spirinchus thaleichthys*	FT/CSSC
Eulachon	*Thaleichthys pacificus*	FT
Largemouth bass	*Micropterus salmoides*	None
Resident Rainbow trout	*Oncorhynchus mykiss*	None
Brown trout	*Salmo trutta*	None
American shad	*Alosa sapidissima*	None
Striped bass	*Morone saxatilis*	None

[a]**Status Key**

FE = Federal Endangered
FT = Federal Threatened
FSC = Federal Species of Concern
C = Federal Candidate species
SE = State Endangered
ST = State Threatened
CSSC = California Species of Special Concern

[b]Critical Habitat has been designated for this species.
[c]ESU = Evolutionarily Significant Unit
[d]DPS = Distinct Population Segments

Source: CDFG, 2009.

12.2.1.3 Export Service Area Reservoirs

The CVP and SWP reservoirs (including San Luis Reservoir) that supply the service areas within the Extended Study Area support warmwater and coldwater sport fish, such as striped bass (*Morone saxatilis*), largemouth bass, and resident rainbow trout (*Oncorhynchus mykiss*). Fish species listed as sensitive, threatened, or endangered are found downstream of the major Central Valley reservoirs and in the Sacramento-San Joaquin Delta (Delta), but do not persist in the aqueduct and other constructed water conveyance and storage facilities. The fish species of management concern that are found in the Sacramento River Watershed and Delta are discussed in more detail in Section 12.2.2. Fish species of primary management concern that occur within and downstream of the CVP and SWP export service area reservoirs of the Extended Study Area are listed in Table 12-1 (NMFS, 1999).

12.2.2 Secondary Study Area

12.2.2.1 Methodology

A county-level CNDDB (CDFG, 2009) search was conducted to determine the special-status fish species that may occur within the 22 counties of the Secondary Study Area. For fish species listed pursuant to the Federal Endangered Species Act (FESA) that could occur within the Sacramento/San Joaquin River and Delta region, the Sacramento Fish and Wildlife Office's Endangered Species Program website (USFWS, 2010) was consulted. For species listed pursuant to the California Endangered Species Act (CESA) in this region, the January 2011 Endangered and Threatened Animal List maintained by CDFG was consulted (CDFG, 2011a). Documents or data specific to areas and species within the Secondary Study Area were also reviewed to characterize aquatic biological resources.

12.2.2.2 Sacramento River Watershed

The aquatic environments associated with the Sacramento River Watershed include Shasta Lake, Keswick Reservoir, Whiskeytown Reservoir, Spring Creek, Clear Creek, and the Sacramento River downstream of Keswick Dam. The Sacramento River Watershed drains an area of approximately 27,000 square miles and is the largest watershed in California (Figure 12-1). Its headwater streams upstream of Shasta Dam include the Fall, Upper Sacramento, Pit, and McCloud rivers. The watershed also includes the Feather River and American River watersheds.

The Sacramento River Watershed supports several fish species of primary management concern (Table 12-2), including green sturgeon (*Acipenser medirostris)*, Central Valley steelhead, and winter-, spring-, fall-, and late-fall-run Chinook salmon.

Table 12-2
Fish Species of Primary Management Concern in the Sacramento River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Central Valley Chinook salmon, winter-run[b]	Sacramento River downstream of Keswick Dam	FE/SE
Central Valley Chinook salmon, spring-run[b]	Sacramento River downstream of Keswick Dam	FT/ST
Central Valley Chinook salmon, fall/late fall-run	Sacramento River downstream of Keswick Dam	FSC/CSSC
Central Valley steelhead[b]	Sacramento River downstream of Keswick Dam	FT

Table 12-2
Fish Species of Primary Management Concern in the Sacramento River Watershed Portion of the Secondary Study Area

Green sturgeon	Sacramento River downstream of Keswick Dam	FT/CSSC
White sturgeon	Sacramento River downstream of Keswick Dam and Shasta Lake	None
River lamprey	Sacramento River downstream of Keswick Dam	FSC/CSSC
Pacific lamprey	Sacramento River downstream of Keswick Dam	None
Sacramento splittail	Sacramento River downstream of Keswick Dam	FT/CSSC
California roach	Sacramento River and Streams Throughout Study Area	CSSC
Hardhead	Sacramento River downstream of Keswick Dam	CSSC
Largemouth bass	Throughout Study Area	None
Smallmouth bass	Throughout Study Area	None
Spotted bass	Throughout Study Area	None
Landlocked Chinook salmon	Shasta Lake and Whiskeytown Lake	None
Resident rainbow trout	Throughout Study Area	None
Brown trout	Throughout Study Area	None
American shad	Sacramento River downstream of Keswick Dam	None
Striped bass	Sacramento River downstream of Keswick Dam	None

[a]**Status Key**

FE = Federal Endangered
FT = Federal Threatened
FSC = Federal Species of Concern
SE = State Endangered
ST = State Threatened
CSSC = California Species of Special Concern

[b]Critical Habitat has been designated for this species within the Secondary Study Area.

Source: CDFG, 2011a, Moyle, 2002.

Shasta Lake

Shasta Lake supports cold-water and warm-water fisheries. Thermal stratification, which occurs in Shasta Lake annually between April and November, establishes a warm surface water layer (epilimnion), a middle water layer characterized by decreasing temperature with increasing depth (metalimnion or thermocline), and a bottom cold-water layer (hypolimnion). The warm epilimnion of Shasta Lake provides habitat for warm-water fishes, whereas the reservoir's cold metalimnion and hypolimnion provides habitat for cold-water fish species throughout the summer and fall. Hence, Shasta Lake supports a "two-story" fishery during the stratified portion of the year (April through November).

Cold-water species in Shasta Lake include rainbow trout, brown trout (*Salmo trutta*), landlocked white sturgeon, and landlocked Chinook salmon. The lake's rainbow trout and Chinook salmon fishery are sustained through stocking of hatchery-raised fish. Shasta Lake warm-water species include smallmouth bass (*Micropterus dolomieu*), largemouth bass, spotted bass, black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), and brown bullhead (*Ameiurus nebulosus*). Non-game species in Shasta Lake include golden shiner (*Notemigonus crysoleucas*), threadfin shad (*Dorosoma petenense*), common carp, Sacramento sucker (*Catostomus occidentalis*), and Sacramento pikeminnow (*Ptychocheilus* *grandis*). The rainbow trout, Chinook salmon, smallmouth, largemouth, and spotted bass fisheries are important sport fisheries in the area.

Although developed primarily for irrigation, the multiple-purpose Shasta Lake also provides flood control, improves Sacramento River navigation, supplies domestic and industrial water, generates hydropower, provides fish and wildlife habitat, creates opportunities for recreation, and enhances water quality. Since construction, Shasta Dam has played a major role in meeting Bay-Delta water quality standards, and meeting temperature and spawning habitat requirements for the endangered winter-run Chinook salmon (Reclamation, 1999a). These uses of Shasta Lake water cause water surface elevations to fluctuate by approximately 55 feet over the course of a year, which disturbs the reservoir’s littoral (shallow, nearshore) habitats and influences the availability of cold- and warmwater habitats in the lake. Disruptions to littoral habitat also occur from shoreline wave action caused by wind and boating activity (Reclamation et. al., 2003). Littoral habitat supports spawning and rearing habitat for warm-water fish that are important for the sport fishery. These fish include smallmouth, largemouth, and spotted bass; black crappie; bluegill; and green sunfish. These fish species spawn in the spring between March and June. Surface water fluctuations during spring can dewater nests and reduce the amount of overhanging, emergent, and submerged vegetative cover, which can reduce the abundance of these fish species (DWR, 2002).

Keswick Reservoir

Cold-water fish species found in Keswick Reservoir include resident rainbow trout and brown trout. Warm-water species include the same species found in Shasta Lake. CDFG occasionally plants hatchery-reared fish in Keswick Reservoir. The reservoir is accessible from shore and by boat, but it is not heavily used for fishing. Keswick Dam is the uppermost barrier to anadromous fish migrating up the Sacramento River. Because of its small size, Keswick Reservoir does not stratify. Reservoir levels fluctuate daily by one to three feet. The reservoir can fluctuate as much as eight to nine feet on an annual basis. Releases to the Sacramento River have ranged from approximately 3,300 cfs (DWR, 2011) during drought periods and 79,000 cfs during flood events (DWR, 1974).

Whiskeytown Lake

Whiskeytown Lake supports cold-water and warm-water fisheries. Cold-water fish species include rainbow trout, brown trout, landlocked Chinook salmon, and kokanee salmon (*Oncorhynchus nerka*). The lake is well known for its kokanee salmon sport fishery. CDFG plants kokanee in Whiskeytown Lake, but kokanee also spawn in tributaries, such as Brandy and Whiskeytown creeks upstream of the reservoir. Warm-water fish species include largemouth bass, crappie, green sunfish, and various species of catfish.

The cold-water pool in Whiskeytown Lake is managed to provide cold water for release to the Sacramento River and Clear Creek. Temperature control curtains are operated on Whiskeytown Lake and on Lewiston Reservoir to improve the amount of cold-water pool available for release to the Sacramento River for winter-run Chinook salmon. The Whiskeytown Lake curtains are located at the Judge Francis Carr Powerhouse outlet and at the Spring Creek Tunnel inlet. The Carr Powerhouse curtain prevents the mixing of cold Trinity River water with warm surface water and directs it to the reservoir’s deep cold-water layer. The Spring Creek Tunnel curtain prevents the diversion of warm surface water while allowing the diversion of cold water from the reservoir’s bottom layer. Similar to Shasta Lake, fluctuations in surface water elevations disturb littoral habitat and warm-water fish species important to the sport fishery.

Sacramento River Downstream of Keswick Dam

The Sacramento River supports many resident and anadromous fish (Table 12-2). The Sacramento River supports a wide range of aquatic habitats, from fast-flowing gravel bedded reaches with alternating riffles and pools, to slow-moving off-channel sloughs and oxbows with fine sediments. From Keswick Dam to the City of Red Bluff, the river is relatively narrow and deep with some areas of broader alluvial floodplain. Most of the Chinook salmon spawning habitat in the Sacramento River is located in this reach.

Between the cities of Red Bluff and Colusa, the river meanders over a broad alluvial floodplain, and flow is significantly affected by tributaries during winter storms. From Colusa to the City of Sacramento, the river is constrained by levees. In this reach, high winter flows spill from the river into a system of weirs and bypasses, including the Sutter Bypass and Yolo Bypass. These bypasses can supply important floodplain rearing habitat for outmigrating Chinook salmon from the Sacramento River and its tributaries.

The variability and magnitude of natural seasonal flows on the Sacramento River have been significantly altered for the purposes of irrigation and flood control. The dams and diversions operated by the CVP and local irrigation districts control much of the flow in the Sacramento River. These dams and diversions include the Shasta, Keswick, Trinity, Lewiston, Whiskeytown, and Spring Creek Debris dams, the Anderson-Cottonwood Irrigation District diversion dam and canal, the Red Bluff Diversion Dam (RBDD), the Glenn-Colusa Irrigation District (GCID) pumping plant and canal, and the Tehama-Colusa (T-C) and Corning canals. Shasta Dam has the largest impact on Sacramento River flow. In addition to altering flows, the dam has substantially reduced the quality and availability of habitat for migratory and resident fish species by blocking passage, and reducing the delivery of coarse sediment and large wood debris. The effects of Shasta Dam on spawning habitat quality and flow are especially evident in the Redding area. Downstream of Redding, the tributaries to the Sacramento River, such as Cow Creek and Cottonwood Creek, influence flow and sediment supply and reduce the impacts of Shasta Dam on channel and floodplain habitat.

To protect holding and spawning winter-run Chinook salmon, Reclamation has been required to manage cold-water reservoir storage and releases to maintain daily average water temperatures at or below 56ºF between Keswick Dam and compliance locations between Balls Ferry and Bend Bridge from May 15 to September 30 since 1993. Cold-water releases from Shasta Dam mitigate for loss of habitat up-stream of Shasta Dam, by providing cooler water temperatures in the upper reaches of the river that are still accessible to anadromous fish. In drier years, when reservoir storage is low, the stretch of river in which cold-water temperatures are maintained is shortened by approximately nine miles, ending at Jelly’s Ferry Bridge. Water temperature control was improved in 1997 with the installation of the temperature control device at Shasta Dam. The device allowed greater control over cold-water reserves in Shasta Lake while continuing hydroelectric power generation. Before its installation, Reclamation had to forego power generation to make cold-water releases, especially during periods of low reservoir levels. Figure 12-2 shows average daily water temperatures at points along the Sacramento River from Balls Ferry to Colusa.

To mitigate for the loss of coarse sediment, Reclamation has managed an ongoing gravel augmentation program since 1997 on the Sacramento River, pursuant to the Central Valley Project Improvement Act (CVPIA), to improve Chinook salmon and steelhead spawning habitat in the Redding area upstream of Turtle Bay (RM 299). Prior to Shasta Dam, DWR estimates that the amount of gravel delivered to the river from the watershed above Shasta Dam was approximately 120,000 tons (75,000 cubic yards) per year (DWR, 1980).

A total of 174,670 tons (106,500 cubic yards) of gravel was added to the river by Reclamation, DWR, and CDFG between 1978 and 2005 (North State Resources, 2010). Reclamation continued this effort by adding a total of 54,000 tons of gravel to the river immediately downstream of Keswick Dam from 2006 through 2012(Hannon, pers. comm., 2012). Large in-channel gravel mining pits, which were created when gravel was mined for the construction of Shasta Dam, trap the gravel as it is transported downstream, limiting the amount of spawning habitat that is enhanced and reducing the time the gravel functions as spawning habitat. The gravel is placed upstream of these pits to enhance spawning habitat for winter-run Chinook salmon, which spawn primarily between Keswick Dam and Turtle Bay. Cottonwood Creek supplies an annual average of 65,000 tons of gravel to the Sacramento River, and as a result, the sediment conditions for spawning habitat improve and the effects from Shasta Dam are diminished at the confluence (RM 273) (DWR, 1994).

Blocked access to historical spawning grounds in the upper watershed causes spring-run Chinook salmon to spawn in the same lowland reaches of the Sacramento River that fall-run Chinook salmon use as spawning habitat. The overlap in spawning sites, combined with a slight overlap in spawning timing (Moyle, 2002), may be responsible for inter-breeding between spring and fall-run Chinook salmon. This inter-breeding has been observed in the Feather River (Hedgecock et al., 2001). Since 2008, very few spring-run spawned in the mainstem of the Sacramento River (CDFG, 2011b).

Diversions on the Sacramento River Downstream of Keswick Dam

Of the approximately 424 water diversions on the Sacramento River between Keswick Dam and the City of Sacramento at the I Street Bridge, approximately six percent have fish screens. Most of the diversions occur between the City of Colusa and the City of Sacramento. Diversions that are of significance to the aquatic environment and the proposed Project are the RBDD and the GCID Pumping Plant.

Diversions from the RBDD are made to the T-C and Corning canals at a maximum rate of approximately 2,500 cfs and a maximum annual diversion of about 600,000 acre-feet (TCCA and Reclamation, 2002). Closure of the RBDD gates affects passage of green sturgeon, steelhead, and winter-, spring- and fall-run Chinook salmon. Because of these concerns, the RBDD gates have been closed only from May 15 through September 15, and from June 15 to August 31 since 2009. The new period of gate closure is required in the June 2009 NMFS Operations Criteria and Plan Biological Opinion (NMFS, 2009). Although the gates are open at the beginning and end of the irrigation season, diversions are limited to what is available through pumps that have been installed at the headworks. The Tehama-Colusa Canal Authority (TCCA) constructed an interim pumping plant in 2009 to meet irrigation demands when the diversion dam gates are out. A new pumping plant and fish screen was constructed upstream of RBDD to replace the dam and improve passage for Chinook salmon, steelhead, and green sturgeon. Construction was completed in September 2012. The screen design allows diversion of up to 2500 cfs. The pumping plant has a diversion rate of 2,000 cfs and can be expanded to a rate of 2,500 cfs (Reclamation, 2009).

The GCID Pumping Plant provides water for primarily agricultural irrigation, but also supplies water for rice straw decomposition in the fall and maintenance of waterfowl habitat. The pumping plant is located on an oxbow channel west of the main Sacramento River channel. An interim flat plate fish screen was installed to replace a drum screen structure in 1993 to enhance fish protection at the pumping plant, and a permanent flat plate screen was installed in 2000. The flat plate screen has improved the protection for larval and juvenile anadromous fish at the GCID pumping plant, but investigations and monitoring have indicated that mortality caused by pumping operations is exceeding performance criteria for the facility. Mortality may be the result of predation in the oxbow channel.

To maintain appropriate sweeping and approach velocities at the screen, a "gradient facility" was constructed in the main channel of the Sacramento River upstream of the oxbow. Factors related to the GCID pumping plant and fish screen affecting juvenile fish are the approach and sweeping velocities, bypass position, and potential predations throughout the facility (Vogel, 2005).

Yolo Bypass and Sutter Bypass

Flow from the Sacramento River spills into the Sutter and Yolo bypasses during high flow events. The bypasses form a floodplain corridor that is an important part of the flood control system, but also serves an important floodplain function for juvenile salmonids and other native fish. Fish enter the bypasses through flood relief structures and weirs. The Sacramento River enters the Sutter Bypass at Moulton, Colusa, and Tisdale weirs, and enters the Yolo Bypass at the Freemont Weir. Downstream of the Freemont Weir, Cache Creek and Putah Creek enter the Yolo Bypass. Table 12-3 shows the approximate flow at which the flood relief structures are overtopped and the Sacramento River begins to flood the bypasses.

Table 12-3
Sacramento River flood relief structures and flood control weirs, and approximate flow at which water begins to enter the Sutter Bypass and Yolo Bypass.

Sacramento River Flood Relief Structure and Flood Control Weirs	Approximate Sacramento River Flow at which Structure is Overtopped (cfs)	Adjoining Basin or Bypass
Moulton Weir	65,000	Sutter Bypass
Colusa Weir	37,000	Sutter Bypass
Tisdale Weir	23,000	Sutter Bypass
Fremont Weir	56,000	Yolo Bypass

Note:
cfs = cubic feet per second
Source: NWS, 2011.

The floodplains of the bypasses are very important to rearing Chinook salmon (Sommer et al., 2001a). These areas can be much more productive than the main channel and provide a safe haven from predatory fish (Swenson et al., 2001; Sommer et al., 2001a). It remains unclear whether these spatial differences in feeding and growth result in improved survival. The use of low gradient floodplains does subject juveniles to stranding when high flows subside quickly (NMFS, 1997).

Splittail use floodplains and other shallow areas with emergent vegetation for spawning and rearing. Splittail spawning habitat is greatly increased during periods of floodplain inundation in the Sacramento and San Joaquin basins (Baxter, 1999b).

12.2.2.3 Feather River Watershed

The aquatic environments associated with the Feather River Watershed (Figure 12-3) within the Secondary Study Area include DWR's Oroville facilities (Lake Oroville, Thermalito Diversion Pool, Thermalito Forebay, Thermalito Afterbay, the fish barrier pool, and the Feather River). Issuance of the FERC license for the Oroville facilities is pending as of June 2012. The new license's requirements will affect aquatic habitat associated with and affected by the Oroville facilities, including the Feather River downstream of Oroville Dam.

Fish species of primary management concern found in the Feather River Watershed portion of the Secondary Study Area are shown in Table 12-4. The following information provided for the SWP Oroville Facilities and the Feather River is from DWR's *May 2007 Oroville Facilities Relicensing FERC Project No. 2100 Draft Environmental Impact Report*, unless otherwise noted.

Table 12-4
Fish Species of Primary Management Concern in the Feather River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Central Valley Chinook salmon, spring-run[b]	Feather River downstream of Fish Barrier Dam	FT/CT
Central Valley Chinook salmon, fall- run	Feather River downstream of Fish Barrier Dam	FSC/CSSC
Central Valley steelhead[b]	Feather River downstream of Fish Barrier Dam	FT
Green sturgeon	Feather River downstream of Fish Barrier Dam	FT/CSSC
White sturgeon	Feather River downstream of Fish Barrier Dam	None
River lamprey	Feather River downstream of Fish Barrier Dam	FSC/CSSC
Pacific lamprey	Feather River downstream of Fish Barrier Dam	None
California roach	Feather River and Streams Throughout Study Area	CSSC
Sacramento splittail	Feather River below Fish Barrier Dam	FT/CSSC
Hardhead	Feather River downstream of Fish Barrier Dam	CSSC
Largemouth bass	Oroville Lake, Thermalito Forebay and Afterbay, Feather River downstream of Fish Barrier Dam	None
Smallmouth bass	Oroville Lake, Thermalito Forebay and Afterbay, Feather River downstream of Fish Barrier Dam	None
Spotted bass	Oroville Lake, Thermalito Forebay and Afterbay, Feather River downstream of Fish Barrier Dam	None
Rainbow trout	Lake Oroville, Diversion Pool, Thermalito Forebay	None
Brown trout	Lake Oroville, Diversion Pool, Thermalito Forebay	None
Landlocked Coho salmon	Lake Oroville	None
American shad	Feather River downstream of Fish Barrier Dam	None
Striped bass	Feather River downstream of Fish Barrier Dam	None

[a]Status designations:

FT = federally-listed as Threatened
FSC = federally-listed as Species of Concern
CT = California-listed as Threatened
CSSC = California-listed as Species of Special Concern

[b]Critical Habitat has been designated for this species within the study area.

Source: CDFG 2011a, Moyle 2002.

Lake Oroville

Lake Oroville typically thermally stratifies into three layers (epilimnion, metalimnion, and hypolimnion) beginning in the spring. The lake begins to de-stratify in the fall, and remains relatively uniform throughout the winter. Because of this stratification regime, Lake Oroville supports both cold-water and warm-water fisheries. The cold-water fish use the deeper cooler well-oxygenated hypolimnion, whereas the warm-water fish are found in the warmer shallower epilimnion and near-shore littoral zone. Once Lake Oroville de-stratifies in the fall, the two fishery components mix in their habitat use.

Oroville Dam is operated for water supply, power generation, flood control, and fish and wildlife habitat. Management for these uses causes fluctuations in surface water elevation and storage throughout the year, which affects the availability of cold- and warm-water habitat within layers. Cold-water hatchery-raised fish are stocked in Lake Oroville as yearlings, with the intent that they will grow in the lake before being caught by anglers. Hatchery stocking is necessary to sustain the cold-water fishery. Natural recruitment to the Lake Oroville cold-water fishery is very low because of a lack of spawning and rearing habitat in the reservoir and accessible tributaries, and natural and artificial barriers to migration into tributaries with sufficient spawning and rearing habitat. From 1993 through 2000, Chinook salmon and brown trout were the only salmonid species stocked in the lake. At the recommendations of CDFG, DWR began stocking Coho salmon instead of Chinook salmon and brown trout in 2002 to address an outbreak of Infectious Hematopoetic Necrosis (IHN) at the Feather River Hatchery (Coho salmon are less susceptible to IHN).

Cold water is taken from Lake Oroville's hypolimnion for releases to the Feather River for Chinook salmon and steelhead. Cold-water releases to the Feather River potentially limit the amount of cold water available for salmonids in Lake Oroville.

The Lake Oroville warm-water fishery is self-sustaining. Black bass are the most popular and important fishery, in terms of both popularity with anglers and economic effect on the area. Spotted bass are the most abundant bass species in Lake Oroville, followed by largemouth bass, redeye bass (*Micropterus coosae*), and smallmouth bass. Catfish are the next most popular warm-water sport fish sought by anglers at Lake Oroville; both channel and white catfish inhabit the lake. White and black crappie are also found in Lake Oroville; populations fluctuate widely from year to year. Bluegill and green sunfish are the most abundant sunfish species in Lake Oroville, and redear sunfish (*Lepomis microlophus*) and warmouth (*Lepomis gulosus*) exist in low numbers. Common carp, considered by many to be a nuisance species, are abundant in Lake Oroville. As described for Shasta Lake, fluctuations in surface water elevation affect littoral habitat, which can reduce the abundance of bass and sunfish (DWR, 2002).

The primary forage fish that occur in Lake Oroville are wakasagi (*Hypomesus nipponensis*) and threadfin shad. Threadfin shad were intentionally introduced in 1967 to provide forage for game fish, whereas wakasagi migrated down from an upstream reservoir in the mid-1970s. The population of threadfin shad has dwindled since the early 1990s, which may be a result of poor overwinter survival, or perhaps from competition with wakasagi for habitat and forage.

Thermalito Diversion Pool

The Feather River water temperature requirements create cold-water fishery habitat in the Thermalito Diversion Pool (Diversion Pool). The Diversion Pool is dominated by fish that have come out of Lake Oroville over the spillway or through the power plant, including rainbow trout, brown trout, and Coho salmon. With the exception of excess steelhead from the Feather River Hatchery, the Diversion Pool and the Thermalito Forebay (Forebay) are not stocked with fish by CDFG.

Thermalito Forebay

The Forebay provides habitat primarily for cold-water fish, although the same warm-water fish species found in Lake Oroville are believed to exist in the Forebay in low numbers (DWR, 2007).

Thermalito Afterbay

The Thermalito Afterbay (Afterbay) provides habitat for both cold-water and warm-water fish. Changes in flow rates, pumpback operation, and water surface elevations resulting from project operation affect water temperatures and the quality, quantity, and distribution of fish habitat in the Afterbay.

Fish species observed in the Afterbay include largemouth bass, smallmouth bass, rainbow trout, brown trout, bluegill, redear sunfish, black crappie, channel catfish, common carp, and large schools of wakasagi. Salmonids are not regularly stocked in the Afterbay, however, some years, when the Feather River Fish Hatchery has surplus steelhead (e.g., 2005, 2011, and 2012), they are put in the Afterbay. It is unlikely that any salmonids spawn in tributaries of Thermalito Afterbay. Therefore, rainbow trout and brown trout that occur in the Afterbay likely passed through the Thermalito pumping-generating plant from the Forebay. The Afterbay likely provides good habitat for largemouth, smallmouth, and spotted bass species, and large schools of wakasagi provide a good source of forage fish. Bass nest dewatering from reservoir fluctuations likely limits juvenile recruitment in the Afterbay (DWR, 2004a).

Feather River Downstream of Oroville Dam

Oroville facilities releases are primarily managed to benefit cold-water fisheries. There are several fish species of primary management concern in the Feather River downstream of Oroville Dam (Table 12-4, above), including spring- and fall-run Chinook salmon, Central Valley steelhead, and green sturgeon. The fish barrier weir at the Feather River Fish Hatchery is the most upstream barrier to fish passage on the Feather River downstream of Oroville Dam. The hatchery was constructed to mitigate for the loss of Chinook salmon and steelhead habitat upstream of Oroville Dam.

The Feather River below Oroville Dam, commences at the Low Flow Channel (LFC), which extends eight miles from the Fish Barrier Dam (RM 67) to the Thermalito Afterbay Outlet (RM 59). The LFC of the Feather River conveys releases from the Thermalito Diversion Dam to its confluence with the Afterbay outlet. Minimum flows and ramping criteria in the Feather River were established in an August 1983 agreement between DWR and DFG (DWR, 1983). The agreement specifies that DWR release a minimum of 600 cfs into the Feather River from the Thermalito Diversion Dam for fisheries purposes. Therefore, the LFC is operated at 600 cfs all year with variations in flow occurring rarely, only during flood control releases, or in the summer to meet downstream temperature requirements for salmonids. Water temperatures tend to be coldest in the uppermost portions of the Feather River near the fish barrier dam. Upon issuance of the FERC license, higher DWR releases will likely be required to maintain lower water temperatures in the LFC.

Flows in the high flow channel of the Feather River, which conveys the combined flows from the low flow channel and the Afterbay outlet, are maintained between the minimum flow and a flow no greater than 2,500 cfs from October 15 through November 30 to prevent Chinook salmon redd dewatering during the egg incubation period (DWR, 2007). The flow regime in the reach of the Feather River extending from the Thermalito Afterbay outlet (RM 59) to the confluence of the Feather and Sacramento rivers (RM 0) varies depending on runoff and month. The instream flow requirements below Thermalito Afterbay are 1,700 cfs from October through March, and 1,000 cfs from April through September. In Critical years, however, the minimum flow can be reduced to 1,200 cfs from October to February, and to 1,000 cfs in March (DWR, 2007). Small flow contributions from Honcut Creek and the Bear River, and larger flow contributions from the Yuba River, also influence flow in this segment. The Shanghai Bench between RM 26 and RM 25 and Sunset Pumps between RM 38 and 39 may impede sturgeon passage at lower flow ranges (DWR, 2007).

Oroville Dam, Thermalito Diversion Dam, and the fish barrier dam block gravel contribution to the Feather River. An estimated 97 percent of the sediment from the upstream watershed is trapped in Lake Oroville, resulting in sediment starvation downstream (DWR, 2007).

High flow releases from the Oroville facilities mobilize smaller substrate particle sizes. The smaller substrate sizes are not replaced by upstream gravel, resulting in a gradual coarsening of the particle size distribution of the substrate in the upper portions of the Feather River. Coarsening and armoring of the substrate size can affect the quality of spawning habitat and the distribution of spawning salmonids and other fishes. In general, the reach of river with the highest proportion of coarse substrate components is the low flow channel of the Feather River.

Blocked access to historical spawning grounds in the upper watershed causes spring-run Chinook salmon to spawn in the same lowland reaches of the Feather River as fall-run Chinook salmon. The overlap in spawning sites, combined with a slight overlap in spawning timing (Moyle, 2002) may be responsible for inter-breeding between spring-run and fall-run Chinook salmon in the Feather River (Hedgecock et al., 2001).

The majority of in-river spring-run Chinook salmon spawning is concentrated in the uppermost three miles of accessible habitat in the Feather River downstream of the Feather River Fish Hatchery, although spawning may extend to the downstream portion of the low flow channel upstream of the Thermalito Afterbay outlet (Sommer et al., 2001b).

Most of the natural steelhead spawning and rearing in the Feather River occurs in the low flow channel, particularly in the upper reaches near Hatchery Ditch, a side-channel located between RM 66 and 67 between the Table Mountain Bicycle Bridge and Lower Auditorium Riffle. Limited steelhead spawning also occurs downstream of the Thermalito Afterbay outlet. The smaller substrate size and greater amount of cover (compared to the main river channel) also make these side-channels more suitable for juvenile steelhead rearing (DWR, 2004b). This type of habitat comprises less than one percent of the available habitat in the low flow channel.

12.2.2.4 Trinity River Watershed

The aquatic environment associated with the Trinity River Watershed (Figure 12-4) within the Secondary Study Area includes Reclamation's Trinity River Division (TRD) facilities, which include Trinity Lake, Lewiston Lake, Whiskeytown Lake (which is described in the Sacramento River Watershed section), and the Trinity River downstream of Lewiston Dam.

Fish species of primary management concern found in the Trinity River Watershed portion of the Secondary Study Area are shown in Table 12-5.

Table 12-5
Fish Species of Primary Management Concern in the Trinity River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Chinook salmon, spring-run	Trinity River downstream of Lewiston Dam	CSSC
Chinook salmon, fall- run	Trinity River downstream of Lewiston Dam	CSSC
Steelhead (Klamath Mountains Province DPS)	Trinity River downstream of Lewiston Dam, Klamath River	CSSC

Table 12-5
Fish Species of Primary Management Concern in the Trinity River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Green sturgeon (Northern DPS)	Klamath River and Trinity River	CSSC
White sturgeon	Trinity River and Klamath River	None
River lamprey	Feather River downstream of Fish Barrier Dam, Klamath River	FSC/CSSC
Pacific lamprey	Feather River downstream of Fish Barrier Dam, Klamath River	None
Hardhead	Trinity River, Lewiston Reservoir, Trinity Lake, Klamath River	CSSC
Largemouth bass	Lewiston Reservoir, Trinity Lake	None
Smallmouth bass	Lewiston Reservoir, Trinity Lake	None
Spotted bass	Lewiston Reservoir, Trinity Lake	None
Resident rainbow trout	Trinity River, Lewiston Lake, Trinity Lake, Klamath River	None
Brown trout	Trinity River, Lewiston Lake, Trinity Lake, Klamath River	None
Coho salmon[b]	Trinity River, Lewiston Lake, Trinity Lake, Klamath River	CE, FE (Anadromous only)
American shad	Trinity River downstream of Lewiston Lake, Klamath River	None
Striped bass	Trinity River downstream of Lewiston Lake, Klamath River	None

[a]Status designations:

FE = federally-listed as endangered
FT = federally-listed as Threatened
FSC = federally-listed as Species of Concern
CE = California-listed as Endangered
CT = California-listed as Threatened
CSSC = California-listed as Species of Special Concern

[b]Critical Habitat has been designated for this species within the study area.

Note:

DPS = distinct population segment

Source: DFG 2011a, Moyle 2002.

Trinity Lake and Lewiston Lake

Releases from Trinity Lake are re-regulated in Lewiston Lake prior to release downstream into the Trinity River. Lewiston Lake also acts as a forebay for the trans-basin export of water into Whiskeytown Lake via the Clear Creek Tunnel.

TRD operation is integrated with operation of the Shasta Division of the CVP. For example, TRD exports have been made in consideration of minimum flow and temperature requirements in the Trinity and Sacramento rivers, storage levels and cold-water pool in Trinity and Shasta lakes, and other CVP operating requirements (e.g., CVP deliveries, water quality requirements, and the OCAP BO). Trinity Lake is also operated to maximize power production during the summer and fall. The majority of TRD exports occur in the spring and summer. At the same time, temperature objectives to protect Trinity River salmon must be met. Addressing the temperature needs of the two systems is only one of the factors that influence operations.

Based on the Trinity River Mainstem Fishery Restoration ROD, dated December 19, 2000, a total of 368,600 to 815,000 AF is allocated annually for Trinity River flows. This amount is scheduled in coordination with the USFWS to best meet habitat, temperature, and sediment objectives in the Trinity River Basin (USBR, 2008).

Trinity River and Klamath River Downstream of the Trinity River

The Trinity River is the largest tributary to the Klamath River. Lewiston Dam releases are the major component of Trinity River flows until its confluence with the North Fork Trinity River. Downstream of the confluence, the accretion of tributary inflows, such as Willow Creek, reduces the dampening effects of the TRD.

The Klamath River flows from its confluence with the Trinity River to the Pacific Ocean. Species of management concern in the Trinity and Klamath rivers (Table 12-5) include Coho salmon, steelhead, spring- and fall-run Chinook salmon, and green sturgeon. The reach of the Klamath River within the Secondary Study Area is a migration route for these species to spawning habitat in the Trinity River and farther up in the Klamath River Watershed.

12.2.2.5 American River Watershed

The aquatic environments associated with the American River Watershed (Figure 12-5) within the Secondary Study Area include Folsom Lake, Lake Natoma, and the American River downstream of Nimbus Dam.

Fish species of primary management concern found in the American River Watershed portion of the Secondary Study Area are shown in Table 12-6.

Table 12-6
Fish Species of Primary Management Concern in the American River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Central Valley Chinook salmon, fall-run	American River downstream of Nimbus Dam	FSC/CSSC
Central Valley steelhead[b]	American River downstream of Nimbus Dam	FT
Green sturgeon	American River downstream of Nimbus Dam	FT
White sturgeon	American River downstream of Nimbus Dam	None
River lamprey	American River downstream of Nimbus Dam	FSC/CSSC
Pacific lamprey	American River downstream of Nimbus Dam	None
California roach	American River and Streams Throughout Study Area	CSSC
Sacramento splittail	American River downstream of Nimbus Dam	FT/CSSC
Hardhead	Folsom Lake, Lake Natoma, American River	CSSC
Largemouth bass	Folsom Lake, Lake Natoma, American River	None
Smallmouth bass	Folsom Lake, Lake Natoma, American River	None
Spotted bass	Folsom Lake, Lake Natoma, American River	None
Rainbow trout	Folsom Lake, Lake Natoma	None

Table 12-6
Fish Species of Primary Management Concern in the American River Watershed Portion of the Secondary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Brown trout	Folsom Lake, Lake Natoma	None
American shad	American River	None
Striped bass	American River	None

[a]Status designations

FT = federally-listed as Threatened
FSC = federally-listed as Species of Concern
CT = California-listed as Threatened
CSSC = California-listed as Species of Special Concern

[b]Critical Habitat has been designated for this species within the study area.

Source: DFG 2011a, Moyle 2002.

Folsom Lake and Lake Natoma

Similar to the other large Central Valley reservoirs, strong thermal stratification occurs within Folsom Lake annually between November and April. Largemouth bass, smallmouth bass, spotted bass, bluegill, crappie, and catfish constitute the primary warm-water sport fisheries of Folsom Lake. The lake's cold-water sport species include rainbow and brown trout, kokanee salmon, and Chinook salmon, all of which are currently or have been stocked by DFG. Although brown trout are no longer stocked, a population still remains in the lake. These species are stream spawners and, therefore, do not reproduce within the lake. However, some spawning by one or more of these species may occur in the American River upstream of Folsom Lake. Other species that occur in the lake include hardhead and Sacramento pikeminnow.

Folsom Lake's cold-water pool is important not only to the lake's cold-water fish species, but also to lower American River fall-run Chinook salmon and steelhead. Seasonal releases from the lake's cold-water pool provide thermal conditions in the lower American River that support annual in-river production of these salmonid species. The cold-water pool in Folsom is primarily managed to sustain releases during October and November to maximally benefit fall-run Chinook salmon immigration, spawning, and incubation, but is not large enough to allow for cold-water releases during the warmest months (July through September) to provide maximum thermal benefits to lower American River steelhead.

Folsom Reservoir, because of its proximity to the Delta, is also often used by Reclamation to make releases when additional Delta outflow is required to meet Delta salinity standards. Consequently, Folsom Reservoir storage can be reduced, resulting in reduced cold-water pool volume. A reduced cold-water pool in Folsom Reservoir may result in releases from Nimbus Dam that are warmer and have the potential to exceed suitable water temperature ranges for fish species of focused evaluation in the American River. Nimbus Dam and Powerplant are located downstream from Folsom Dam. The dam forms Lake Natoma, which re-regulates water released from Folsom Dam and diverts water into the Folsom South Canal. Water not diverted is released into the American River through radial gates. Nimbus Dam is the most upstream barrier to fish passage on the American River.

American River Downstream of Nimbus Dam

The lower American River provides a diversity of aquatic habitats, including shallow fast-water riffles, runs, pools, and off-channel backwater habitats.

At least 40 species of fish have been reported to occur in the lower American River system, including numerous resident native and introduced species, as well as several anadromous species (SWRI, 2004).

With more than 125 miles of available upstream salmonid spawning habitat, the American River historically served as a regionally vital component for the health of fall- and spring-run Chinook salmon populations (Water Forum, 2001). Although dam construction eliminated the spring-run fishery, the lower American River continues to function as spawning and rearing habitat for large numbers of fall-run Chinook salmon. The river supports a mixed run of hatchery and naturally produced fish. During the period of 1967 through 1991 (the Anadromous Fish Restoration Program restoration goal baseline period), lower American River fall-run Chinook salmon spawning comprised on average approximately 21 percent (41,040 fish) of total fall-run Chinook salmon escapement (197,740 fish) in the Sacramento Valley river system, including the Sacramento River and its tributary rivers and creeks (DFG, 2011b). Recent escapement estimates (1992 to 2002) for the Central Valley suggest that American River fall-run Chinook salmon comprise approximately 22 percent of the total fall-run Chinook salmon escapement in the Sacramento River and its major tributaries (68,373 of 311,746) (PFMC, 2003).

The lower American River also provides spawning and rearing habitat for Central Valley steelhead. The majority of the steelhead run is believed to be of hatchery origin.

The primary factor potentially limiting fall-run Chinook salmon and steelhead production within the lower American River is believed to be high water temperatures during portions of their residency in the river. High water temperatures during the fall can delay the onset of spawning by Chinook salmon, and river water temperatures can become unsuitably high for juvenile salmon rearing during spring and for steelhead rearing during summer. In addition, relatively low October and November flows tend to increase the amount of fall-run Chinook salmon redd superimposition (occurs when females dig up the fertilized eggs of other females), thereby potentially reducing the number of juveniles produced per female.

12.2.2.6 Sacramento-San Joaquin Delta

The Delta is a unique aquatic ecosystem that provides complex habitat for a diverse assemblage of fish and macroinvertebrates. Table 12-7 identifies the fish species of primary management concern found within the Delta.

There are many fish species within the Delta that have experienced a general decline in abundance (Moyle et al., 1995). Therefore, many of these species require special management strategies, including winter-run and spring-run Chinook salmon, steelhead, delta smelt, longfin smelt, green sturgeon, and Sacramento splittail. These species are either listed for protection pursuant to FESA or CESA or listed by CDFG as a Species of Special Concern.

Several fish and macroinvertebrate species inhabiting the Delta also support recreational and commercial fisheries, such as fall-run Chinook salmon, northern anchovy, Pacific sardine, starry flounder, striped bass, largemouth bass, and white sturgeon. The Delta has been identified as Essential Fish habitat (EFH) for the commercially managed species (northern anchovy, Pacific sardine, starry flounder, and Chinook salmon) (NMFS, 2011).

USFWS and NMFS have designated all or part of the Delta within the Secondary Study Area as critical habitat or essential fish habitat for delta smelt, Central Valley steelhead, winter- and spring-run Chinook salmon, and green sturgeon.

The listing status, life history, and factors affecting population abundance for the special-status fish species that inhabit the Delta and may be affected by construction or operation of the proposed project are discussed in Appendix 12-A.

Table 12-7
Fish Species of Primary Management Concern in the Sacramento-San Joaquin Delta

Species	Scientific Name	Listing Status[a]		Life History[b]	Designated Habitat[c]
		Federal	State		
Chinook salmon (Sacramento winter-run)	Oncorhynchus tshawytscha	FE	SE	A	EFH
Chinook salmon (Sacramento spring-run)	Oncorhynchus tshawytscha	FT	ST	A	EFH
Chinook salmon (Sacramento fall/late fall-run)	Oncorhynchus tshawytscha	FSC	CSC	A	EFH
Chinook salmon (San Joaquin fall-run)	Oncorhynchus tshawytscha	FSC	CSC	R	EFH
Central Valley steelhead	Onorhynchus mykiss	FT	None	A	CH
Green sturgeon-southern DPS	Acipenser medirostris	FT	CSC		CH
Longfin smelt	Spirinchus thaleichthys	FSC	ST	A	None
Delta smelt	*Hypomesus transpacificus*	FT	ST	R	CH
Sacramento splittail	*Pogonichthys macrolepidotus*		CSC	R	None
River lamprey	Lampetra ayresii	None	CSC	A	None
Hardhead	Mylopharodon conocephalus	None	CSC	N	None
Striped bass	*Morone saxatilis*	None	None	R, A	None
Black bass	*Micropterus spp*	None	None	R	None
Sacramento perch	Archoplites inrerruptus	None	CSC	N[d]	None
Tidewater goby	Eucyclogobius newberri	FE	CSC	N	CH
Rough sculpin	Cottus asperrimus	None	ST; FP	R	None
Northern anchovy	Engraulis mordax	None	None	N	EFH
Pacific sardine	Sardinops sagax caerulea	None	None	N	EFH
Starry flounder	Platichthys stellatus	None	None	N	EFH

[a]Listing Status:
FE = Federal endangered
FT = Federal threatened
FSC = Federal species of concern
SE = State endangered
ST = State threatened
FP = State fully-protected species
CSC = State species of special concern

[b]Life History:
A = anadromous
R = resident
N = non-resident visitor

[c]Designated Habitat:
CH = Critical habitat
PCH = Proposed Critical Habitat
EFH = Essential fish habitat

[d]Essentially extirpated from the Delta

Note:
DPS = distinct population segment

Source: DFG, 2009, DFG, 2011a, Moyle, 2002, NMFS, 2011.

Many of the fish and macroinvertebrate species inhabit the Delta year-round; other species inhabit the system on a seasonal basis as a migratory corridor between upstream freshwater riverine habitat and coastal marine waters, as seasonal foraging habitat, or for reproduction and juvenile rearing habitat (Table 12-8).

The geographic distribution of fish species within the Delta is determined, in part, by salinity gradients, which range from fresh water within the Sacramento and San Joaquin river systems, to marine conditions near the Golden Gate Bridge (Moyle et-. al., 1982). The majority of fish species in the Delta use the Tidal

Perennial Aquatic community (see Affected Environment and the CALFED Ecosystem Restoration Program Plan for detailed description of the aquatic communities in the Delta).

The abundance, distribution, and habitat use by these fish and macroinvertebrates has been monitored for many years through investigations conducted by CDFG, NMFS, USFWS, DWR, and several other investigators. Results of these monitoring programs have shown evidence of long-term declines and sharper declines since the early 2000s in some of the Delta pelagic fish species (Baxter et al., 2010).

Table 12-8
Seasonal Occurrence of Different Life Stages of Migratory Fish Species of Primary Management Concern within the Sacramento-San Joaquin Delta

Species	Adult Migration (peak)	Spawning (peak)	Juvenile Freshwater Residency (all freshwater residency, not Delta residency)	Outmigration (peak)	Source
River lamprey	Fall	N/A	3-5 years	Spring	Moyle, 2002
Pacific lamprey	Jan-June (Mar-May)	N/A	5-7 years	Spring	Moyle, 2002
Green sturgeon	Feb-July	N/A	1-4 years	Aug-Oct	Federal Register, 2005; Moyle, 2002
Chinook salmon (Sacramento winter-run)	Dec-July (Mar)	N/A	5-10 months	Oct-May	Moyle, 2002; CDFG, 2010
Chinook salmon (Sacramento spring-run)	Mar-Sep (May-June)	N/A	3-15 months	Nov-Jun	Moyle, 2002; CDFG, 2010
Chinook salmon (Sacramento fall-run)	June-Dec (Sep-Oct)	N/A	1-7 months	Jan-Jun	Moyle, 2002; CDFG, 2010
Chinook salmon (Sacramento late fall-run)	Oct-Apr (Dec)	N/A	7-13 months	Apr-Sep	Moyle, 2002; CDFG, 2010
Central Valley steelhead	Aug-Mar (Sep-Oct)	N/A	1-3 years	Jan-Jun	Moyle, 2002; CDFG, 2010
Delta smelt	Dec-Mar (Jan)	Feb-July (Apr-May)	4-5 months	N/A	Moyle, 2002; Bennett, 2005
Longfin smelt	Winter	Nov-June (Feb-Apr)	0-2 months	Jan-Aug (Apr-June)	Moyle, 2002
Sacramento splittail	Dec-Mar	Feb-July (Mar-May)	All Year	N/A	Moyle, et al., 1995; Moyle, 2002
Striped bass	Apr-June	Apr-May	All Year	N/A	SWRI, 2003

Note:
N/A = not applicable because these species do not spawn in the Delta

Stressors Affecting Delta Fish Species

Pelagic organisms (organisms that live at or near the water's surface) live in the ocean or in estuaries like the Delta. Many pelagic organisms provide a resource base in the Delta food web, and can be considered key indicator species of the overall health and condition of the system they inhabit.

Since approximately 2005, there has been a significant effort to study the declining native fish populations in the Delta. The Interagency Ecological Program (IEP), consisting of scientists and managers representing six federal and three state agencies, is evaluating the possible causes of pelagic organism decline

(Baxter et al., 2010). In June 2006, the Legislature directed the Resources Agency to report on proposed actions to address the pelagic organism decline, and to stabilize the ecosystem in the Delta.

Since approximately 2002, the abundance indices calculated by the IEP fall Midwater Trawl survey demonstrated significant declines in numerous pelagic fishes within the Delta including the delta smelt, longfin smelt, age-0 striped bass, and threadfin shad (Baxter et al., 2010). The declines of these four species appeared to occur simultaneously despite the differences in their life histories and how these species utilize Delta habitats, suggesting that one of more Delta-wide factors contributed to the decline (Baxter et al., 2010).

The basic conceptual model for the pelagic organism decline contains four major components based on the following hypotheses: (1) prior fish abundance - continued low abundance of adults leads to low juvenile production (i.e., stock-recruitment effects); (2) habitat - the amount of water (volume or surface area) with suitable conditions for a species has changed because changes in estuarine water quality variables, disease, and toxic algal blooms in the estuary affect survival and reproduction; (3) top-down effects - predation and water project entrainment affect mortality rates; and (4) bottom-up effects - consumable resources and food web interactions affect survival and reproduction (Baxter et al., 2010). Stressors affecting the fish species of primary management concern within the Delta are discussed below.

Delta Agricultural Diversions

There are approximately 2,200 water diversions within the Delta (Herren and Kawasaki, 2001; Reclamation, 2008). Although entrainment by agricultural diversions is not frequently identified as a factor in the decline of Delta fish species, most of these small diversions are not screened (Herren and Kawasaki, 2001). The majority of the diversions divert water to agricultural fields between April and August. The early part of this irrigation season coincides with the timing of spawning and larval development of fish species of primary management concern in the Delta. Because spawning and larval development are likely to occur in shallow shoreline locations and movement is limited, entrainment of these life stages by agricultural diversions may be more substantial (Reclamation, 2008).

Reverse Flows

The CVP and SWP both divert water from Old River, a tidal slough that intersects the lower San Joaquin River. CVP and SWP diversions can cause the tidally averaged flow in the Old River, Middle River, and other adjacent channels in the southern Delta to reverse flow toward the diversions. These reverse flows contribute to the entrainment of numerous fish species, including migrating and spawning delta smelt. Patterns of entrainment vary with life history and season, as well as food availability and water quality (Grimaldo et al., 2009).

Reverse flows also affect downstream migrating juvenile Chinook salmon and steelhead. Pilot studies of the effect of Delta Cross Channel (DCC) operations on the movement of juvenile Chinook salmon in the Delta indicate that yearlings will move into the Delta Cross Channel during flood tides, and can be drawn into the channel after initially migrating past the channel gates (CALFED, 2000).

Non-Native Species

The Delta is one of the most biologically invaded estuaries in the world. Non-native species have been introduced intentionally and unintentionally. Many introduced species are considered undesirable, and some of these species are believed to adversely affect the ecosystem within the Delta. For example, since the introduction of the overbite clam (*Corbula amurensis*), there has been a reduction of the phytoplankton, thereby affecting the productivity of the estuary with a corresponding reduction in zooplankton and pelagic fish production. Historic relationships between Delta outflow and the populations of longfin smelt and striped bass have shifted since the introduction of this clam (Baxter et al., 2010).

The Delta also has experienced successive invasions of copepod species. Copepods are zooplankton that form the food base for many pelagic fishes. The most recently introduced copepod, *Limnoithona tetraspina*, displaced the previously dominant copepod species (*Psuedodiaptomus forbesi*) in the early 1990s. The abundance of other copepods has decreased continuously since its introduction. *Limnoithona* is a less suitable food item than the previous species (Baxter et al., 2010).

Toxins

Anthropogenic and environmental toxins could also have adversely affected fish populations (DWR and CDFG, 2007). Although initial data on striped bass and delta smelt indicated high frequencies of liver lesions and other signs of disease indicative of toxic poisoning (Armor et al., 2005), subsequent studies have shown that acute contaminant toxicity is not likely the cause for population declines, but could be a contributor (Baxter et al., 2010). Two toxins have received special attention: pyrethroid pesticides and *Microcystis* hepatotoxins (toxins that damage the liver).

Pyrethroid pesticides have received special attention in pelagic organism decline studies because of their increased use in recent years and their high toxicity to aquatic organisms. Although pyrethroids are readily absorbed into sediment, they can be mobilized during high flow events and are highly toxic to zooplankton and fish (Werner et al., 2006). Although it has been shown that these pesticides have the capacity to affect pelagic fish populations, a direct link to pelagic organism decline has yet to be demonstrated (Armor et al., 2005).

Microcystis is a colonial cyanobacteria that produces hepatotoxins that can affect both fish and humans. Blooms of *Microcystis* have become larger and more widespread during the summer. Reduced stream flow in the Delta seems to promote the growth of *Microcystis* and is more abundant in dry years (Baxter et al., 2010). *Microcystis* blooms have not yet been identified as a primary cause of the pelagic organism decline (Baxter et al., 2010).

Water Exports

CVP and SWP exports can influence the magnitude of flows into the Delta and the outflow from the Delta into Suisun Bay. Along with Delta inflow, Delta outflow is an important regulator of habitat quality and availability, and fish distribution, survival, and abundance (Baxter et al., 2010). Delta inflow and outflow are important for species residing primarily in the Delta (e.g., delta smelt and longfin smelt) (USFWS, 2008), and juveniles of anadromous species (e.g., Chinook salmon, steelhead, and green sturgeon) that rear in the Delta prior to ocean entry. CVP and SWP operations can increase fish entrainment, redirect fish into areas with higher risks of mortality, affect salinity, and degrade essential habitat conditions. The rate and location that water is diverted from the Delta affects the residence time of water in Delta channels, which affects primary and secondary production. High residence time allow phytoplankton to accumulate in the Delta (Kimmerer, 2004).

Water exports indirectly affect pelagic fish by changing the hydrology and salinity of the estuary. Hydrologic changes caused by water exports include changes in flow magnitude and direction (especially in the south Delta), movement of water from the Sacramento River into and through the central Delta, and changes in the amount of low salinity habitat available for fish that depend on this type of habitat.

Assessment of the indirect effects of exports has been focused largely on the position of the two parts per thousand (ppt) salinity isopleth (i.e., the “X2” location) and the relative abundance of low salinity habitat (USFWS, 2008; NMFS, 2009).

Most of the fish species of special concern are affected by Delta Cross Channel operation, including all races of Chinook salmon, steelhead, American shad, striped bass, and green and white sturgeon. The Delta Cross Channel is not screened. However, the gates of the Delta Cross Channel can be operated to reduce flow from the Sacramento River into the central Delta.

Efforts have been made to reduce water diversions in the spring, when diversions are believed to have the greatest impacts on fish in the Delta. However, during these years, the total amount of water exported from the Delta annually has increased substantially. The most notable changes have included a slight increase in flow down the Sacramento River since 2001, a reduction in peak San Joaquin River outflows since 1999, and increased exports during June through December (DWR and CDFG, 2007).

Delta smelt are affected by Delta Cross Channel operation, both during upstream migrations by spawning adults and during downstream transport of larvae (Reclamation et. al., 2003). Increased winter exports entrain early spawning delta smelt. The early spawners tend to be the largest and most robust individuals. Increased entrainment of the most robust members of the delta smelt population may be weakening the population when combined with other factors, such as increased predation (Bennett, 2005; DWR and CDFG, 2007).

In general, the majority of juvenile Chinook salmon (primarily fall-run Chinook salmon) are primarily observed in salvage operations during the late winter and early spring. The juveniles may include yearling spring-run and fall-run salmon, late fall-run salmon smolts, and pre-smolt winter-run juvenile salmon. Steelhead are primarily observed in salvage during the spring months.

Striped bass are primarily observed in salvage operation during late spring and summer. Delta smelt are primarily observed in salvage operation during the winter and spring months. Longfin smelt are primarily observed in the salvage operation during the spring (Grimaldo et al., 2009). A variety of other resident and migratory fish species are also collected as part of both SWP and CVP salvage operations (Reclamation et. al., 2003). Fish that are not bypassed by the salvage facility may survive passage through the pumps and enter the aqueduct. Fish, including striped bass and resident species, may rear in the canals and downstream reservoirs. These fish support recreational fisheries both in the aqueduct and in downstream reservoirs (Reclamation et al., 2003).

Operation of the SWP, in combination with CVP export operations, influences the hydrology within south Delta channels. Several management actions, including seasonal reductions in SWP and CVP export rates relative to Delta inflow (export/inflow ratio), have been implemented to reduce or avoid adverse effects of changes in hydrology and the vulnerability of species to salvage operations (Reclamation et al., 2003).

Reduced Habitat Quality

Habitat quality is directly related to fish abundance; an overall reduction in habitat quality tends to coincide with long-term declines in delta smelt, striped bass, and threadfin shad (Feyrer et al., 2007). The factors relating to fish abundance are water clarity and specific conductance[2] for delta smelt and striped bass, and specific conductance and temperature for threadfin shad. In addition, several other water quality, physical,

[2] Specific conductance is a measure of how well water can conduct an electrical current; it is an indicator of salinity levels.

and biological parameters, including dissolved oxygen, geomorphology, vegetation, predation, and food availability, could also result in changes in the abundance of these species (Baxter et al., 2010).

The purpose of the South Delta Temporary Barriers Project is to benefit local agricultural diversions by increasing water levels and circulation, and to improve fishery conditions for up-migrating adult salmon and out-migrating smolts (Reclamation et al., 2003). This program was initiated to assess the effects of temporary barriers on water quality, fisheries, and vegetation as a basis for predicting the effects of installing permanent barriers in the southern Delta.

The additional flow in the San Joaquin River helps maintain adequate dissolved oxygen concentrations for adult salmon migrating upstream (Reclamation et al., 2003). The barrier is notched at the top in the fall to allow passage of salmon migrating up Old River to enter the San Joaquin River. During spring, the barrier remains fully closed to prevent downstream migrating salmon smolts in the San Joaquin River from entering Old River, which avoids subsequent exposure to SWP, CVP, and agricultural diversions. In recent years, however, culverts have been installed in the barrier to improve water levels in the south Delta that allow some fish movement from the San Joaquin River into Old River. The other three temporary barriers are traversed by several buried 48-inch pipes, with flap gates on one end that allow unidirectional flow. These barriers operate by allowing water to flow through the pipes and flap gates during flood tides to fill the upstream channels. During ebb tides, the flap gates close to retain water in the channels.

Low Salinity Habitat and X2 Location

The Delta's low salinity habitat (LSH) is an area of the estuary characterized by higher levels of particulates, higher abundances of several types of organisms, and maximum turbidity. As a consequence of higher levels of particulates, the LSH may be biologically significant to some species. It is commonly associated with the location of the 2 ppt salinity isopleth (X2), but actually occurs over a broader range of salinities from 1 to 6 ppt. Historically, mixing and circulation in this area concentrated plankton and other organic material, thus increasing food biomass availability. Since approximately 1987, however, the introduced Asian clam population has reduced much of the primary production in the estuary, and there has been virtually no enhancement of phytoplankton production or biomass in the LSH (Reclamation et al., 2003).

Over the course of a year, X2 location can vary between San Pablo Bay during high Delta outflow (high river flow periods) and Rio Vista during low Delta outflow (summer). In recent years, it has typically been located between approximately Honker Bay and Sherman Island. X2 location is controlled directly by the volume of Delta outflow, although changes in X2 location lag behind changes in outflow. Although recent evidence indicates that X2 location and LSH are not as closely related as previously believed (Reclamation et al., 2003), X2 location continues to be used as an index of the location of LSH.

Predation

Fish (juvenile salmon, juvenile striped bass, and other species) that enter Clifton Court Forebay may reside in the forebay. Once in the forebay, fish may be eaten by other fish or taken by anglers (pre-screening losses); entrained by the pumps at the Banks Pumping Plant (direct loss); impinged on the fish screens at the Skinner Fish Protection Facility (direct loss); or bypassed and salvaged at the Skinner Fish Protection Facility (salvage). CDFG views predation on fish entrained in the forebay as a concern because it may exceed natural predation rates in Delta channels (Reclamation et al., 2003).

The existing intake structure and gates are believed to provide cover and a feeding station for predators. Predation losses are believed to be very high (Reclamation et al., 2003).

Survival of young striped bass in Clifton Court Forebay is also low. Six percent of young-of-the-year striped bass released at the radial gates survived passage across the forebay (Reclamation et al., 2003). The losses for both striped bass and salmon are attributed to predation. Sub-adult striped bass are the major predatory fish in Clifton Court Forebay (Reclamation et al., 2003). These fish are most abundant near the radial gates during winter and spring, when small fish may be particularly vulnerable. Predators have been periodically removed from the Forebay and released in the Delta. In 1993, striped bass made up 96 percent of the predators removed, followed by white catfish and channel catfish (Reclamation et al., 2003).

12.2.2.7 San Francisco Bay Estuary (including San Pablo Bay and Suisun Bay)

The San Francisco Bay Estuary is located at the terminus of the San Joaquin and Sacramento River network, where water draining from the Sacramento Valley enters the Pacific Ocean. It is the largest estuary on the west coast, encompassing roughly 1,600 square miles of central California (NOAA, 2012).

The estuary is surrounded by a contiguous urbanized region and has been greatly modified by 150 years of intensifying human activity (Nichols et al., 1986). Ninety percent of California's remaining coastal wetlands are located in the region. San Francisco Bay is recognized for protection by the California Bays and Estuaries Policy.

The San Francisco Bay Estuary is commonly divided into four different sub-regions: Suisun Bay, North Bay/San Pablo Bay, Central Bay, and South Bay. Each region has a distinct ecological structure defined by the local tidal datum, amount of fresh water influx, sediment input, and the underlying geology (NOAA, 2012). Water passes through the Delta, via the Sacramento-San Joaquin Rivers, and enters Suisun Bay which flows through the Carquinez Straight into San Pablo Bay. San Pablo Bay connects at its south end to Central and South Bays that together form what is known as the "San Francisco Bay".

Suisun Bay is a shallow embayment between Chipps Island at the western boundary of the Delta and the Benicia-Martinez Bridge at the eastern end of Carquinez Strait. Adjacent to Suisun Bay is Suisun Marsh, the largest brackish marsh in the United States. The narrow, 12-mile-long Suisun Bay is a large area of open water that is transitional between the freshwaters of the Delta and the saltwaters of San Francisco Bay; it is a shallow region of wind-stirred, brackish water, lined with tidal marshes (Moyle, 2008). Suisun Marsh is an approximately 74,130-acre marsh that is largely managed as freshwater wetlands to support waterfowl hunting (Moyle, 2008). Suisun Marsh maintains its freshwater character because of inflow from the Sacramento River via Montezuma Slough (Moyle, 2008). Large tidal gates on the upper end of Montezuma Slough control salinity in the marsh by allowing freshwater to flow in but preventing the tides from pushing it back out again (Moyle, 2008).

The estuary's aquatic and wetland habitats range from the brackish water of the lower delta and Suisun Bay to the dilute salt water of San Pablo Bay, and the highly saline waters of South San Francisco Bay (NOAA, 2012). Delta outflow interacts with tides to determine how far salt water intrudes from the ocean into the estuary. Delta outflow varies with hydrology, reservoir releases, and diversions upstream (DWR, 2009).

Fish species that are found in the estuary are virtually the same as those in Delta, although the estuary is more likely to contain euryhaline[3] marine species and early life history stages of estuarine-dependant species such as striped bass, delta smelt, and longfin smelt (Moyle, 2002). Fish species abundance and distribution in the estuary are influenced by seasonal and annual variability in hydrologic conditions,

[3] Capable of tolerating a wide range of salt water concentrations.

including the magnitude of flows into the Delta from the Sacramento and San Joaquin Rivers and other tributaries, outflow from the Delta into San Francisco Bay, and the salinity gradient which varies by region and fluctuates with outflow and tidal actions from the Pacific Ocean (Moyle, 2008).

Table 12-9 lists the species of management concern that are found in estuary. A county-level CNDDB (CDFG, 2009) search was conducted to determine the special-status fish species that may occur within the 22 counties of the Secondary Study Area. For fish species listed pursuant to FESA that could occur within the Delta region and San Francisco Bay Estuary, the Sacramento Fish and Wildlife Office's Endangered Species Program website (USFWS, 2010) was consulted. For species listed pursuant to CESA in this region, the January 2011 Endangered and Threatened Animal List maintained by DFG was consulted (CDFG, 2011a). Documents or data specific to areas and species within the Secondary Study Area were also reviewed to characterize aquatic biological resources.

Table 12-9
Fish Species of Primary Management Concern in the San Francisco Bay Estuary

Species	Scientific Name	Listing Status[a]		Designated Habitat[b]
		Federal	State	
Chinook salmon (Sacramento winter-run)	Oncorhynchus tshawytscha	*FE*	SE	EFH
Chinook salmon (Sacramento spring-run)	Oncorhynchus tshawytscha	*FT*	ST	EFH
Chinook salmon (Sacramento fall/late fall-run)	Oncorhynchus tshawytscha	*C*	CSC	EFH
Central Valley steelhead	Onorhynchus mykiss	*FT*	—	CH
Green sturgeon-southern DPS	Acipenser medirostris	*FT*	CSC	CH
Longfin smelt	Spirinchus thaleichthys	*FSC*	ST	—
Delta smelt	*Hypomesus transpacificus*	*FT*	ST	
Pacific smelt	Thalechthys pacificus	*FT*	CSC	—
River lamprey	Lampetra ayresii	—	CSC	—
Hardhead	Mylopharodon conocephalus	—	CSC	—
Striped bass	*Morone saxatilis*			
Sacramento perch	Archoplites inrerruptus		CSC	—
Tidewater goby	Eucyclogobius newberri	*FE*	CSC	—
Rough sculpin	Cottus asperrimus	—	ST; FP	—
Northern anchovy	Engraulis mordax	—	—	EFH
Pacific sardine	Sardinops sagax caerulea	—	—	EFH
Starry flounder	Platichthys stellatus	—	—	EFH

[a] Listing Status:

FE = Federal endangered
FT = Federal threatened
FSC = Federal species of concern
SE = State endangered
ST = State threatened
FP = State fully-protected species
CSC = state species of special concern

[b]Designated habitat:

CH = Critical habitat
EFH = Essential fish habitat

Note:
DPS = distinct population segment

Source: DFG, 2009, DFG, 2011a, Moyle, 2002, NMFS, 2011.

The San Francisco Bay Estuary supports a spectrum of diverse habitats that are important to the species that inhabit them. Tidal perennial aquatic habitat is one natural community that occurs within greater

San Francisco Bay ecological zones that many fish species of management concern are highly dependent on. Tidal perennial habitat includes deep water aquatic (greater than 10 feet deep from mean lower low tide [the lowest of the low tides in a day]), shallow aquatic (less than or equal to 10 feet deep from mean lower low tide), and unvegetated intertidal (i.e., tideflats) zones of estuarine bays, river channels, and sloughs (Moyle, 2008).

Many fish spend their entire lives in the tidal perennial aquatic community and use it for foraging, spawning, rearing, resting, and migration. Resident and migratory fish use tidal perennial aquatic habitat for spawning, rearing, foraging, and escape cover. Striped bass, delta smelt, Sacramento splittail, and many resident Bay-Delta fish use this habitat for rearing and as adults (CALFED, 2000). Young steelhead and Chinook salmon forage in these productive waters as fry and juveniles to put on weight before entering the ocean. Changes in physical attributes of the water column, such as flow, salinity and water temperature, provide environmental cues for some species to trigger the timing of biological events, such as migration and spawning.

Fish species that currently depend on these tidal marshes and adjoining sloughs, mudflats, and embayments include delta smelt, longfin smelt, Chinook salmon, green sturgeon, white sturgeon, pacific herring, starry. However, many new species of plants and animals have been introduced. These exotic and invasive species, such as the Chinese mitten crab and Asian clam, threaten to undermine the estuary’s food web and alter its ecosystem (DWR, 2009).

12.2.3 Primary Study Area

12.2.3.1 Methodology

A CNDDB (CDFG, 2009) search was conducted for Colusa and Glenn counties to determine the special-status fish species that may occur in the Primary Study Area. For fish species listed pursuant to FESA that could occur within the Primary Study Area, the Sacramento Fish and Wildlife Office’s Endangered Species Program website (USFWS, 2010) was consulted. For species listed pursuant to CESA in this region, the January 2011 Endangered and Threatened Animal List maintained by DFG was consulted (CDFG, 2011a). Documents or data specific to areas and species within the Primary Study Area were also reviewed to characterize aquatic biological resources. References are cited in the text. In Additionally, DFG conducted fisheries surveys and monitoring within the Primary Study Area (CDFG, 2003; CDFG, 2011c).

12.2.3.2 Waterways that Could be Affected by Project Facilities

The Primary Study Area includes the Sacramento River, Grapevine Creek, Antelope Creek, Funks Creek, Stone Corral Creek, Hunters Creek, Colusa Basin Drain, T-C Canal, GCID Canal, and Funks Reservoir. Fish species of primary management concern found in the Primary Study Area are shown in Table 12-10.

Table 12-10
Fish Species of Primary Management Concern in the Primary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
Central Valley Chinook salmon, winter-run[b]	Sacramento River	FE/CE
Central Valley Chinook salmon, spring-run[b]	Sacramento River	FT/CT
Central Valley Chinook salmon, fall/late fall-run	Sacramento River	FSC/CSSC
Central Valley steelhead[b]	Sacramento River	FT
Green sturgeon	Sacramento River	FT/CSSC
White sturgeon	Sacramento River	None

Table 12-10
Fish Species of Primary Management Concern in the Primary Study Area

Common Name	Range within Watershed	Federal/State Status[a]
River lamprey	Sacramento River and streams throughout Primary Study Area	FSC/CSSC
Pacific lamprey	Sacramento River and streams throughout Primary Study Area	None
California roach	Sacramento River and streams throughout Primary Study Area	CSSC
Sacramento splittail	Sacramento River and Colusa Basin Drain	FT/CSSC
Largemouth bass[c]	Sacramento River, Funks Reservoir, streams throughout Primary Study Area	None
Rainbow trout	Sacramento River	None
Hardhead	Sacramento River	None
American shad	Sacramento River	None
Striped bass	Sacramento River	None

[a]Status designations:
FE = federally-listed as endangered
FT = federally-listed as Threatened
FSC = federally-listed as Species of Concern
CE = California-listed as Endangered
CT = California-listed as Threatened
CSSC = California-listed as Species of Special Concern

Source: DFG, 2009, DFG, 2011a, Moyle, 2002, NMFS, 2011.

[b]Critical Habitat has been designated for this species within the study area.
[c]Includes largemouth bass, smallmouth bass, spotted bass.

Proposed Project facilities within the Primary Study Area, and the waterways that those facilities could affect, are shown in Table 12-11 and in Figure 12-6. The proposed Project Buffer would have the potential to affect the same waterways as the facilities that it would surround.

Table 12-11
Proposed Project Facilities in the Primary Study Area and the Potentially Affected Waterways

Project Facilities	Potentially Affected Waterway
Sites Reservoir Inundation Area	Grapevine Creek, Funks Creek, Stone Corral Creek, Antelope Creek
Sites Reservoir Dams	Stone Corral Creek, Funks Creek
Recreation Areas	None
Roads Relocations and South Bridge	Antelope Creek, Grapevine Creek, Stone Corral Creek, Funks Creek
Delevan Pipeline	Hunters Creek, Colusa Basin Drain
Delevan Transmission Line	None
Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility	Sacramento River
TRR (including the TRR to Funks Creek Pipeline)	Funks Creek
TRR Pipeline, TRR Pipeline Road, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, and Delevan Pipeline Electrical Switchyard	None
GCID Canal Facilities Modifications	Sacramento River
Holthouse Reservoir Complex (including Funks Reservoir Dredging)	Funks Creek
Holthouse Reservoir Electrical Switchyard	None
Sites Reservoir Inlet/Outlet Structure	Funks Creek
Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, and Field Office Maintenance Yard	None

Funks Creek, Stone Corral Creek, Grapevine Creek, and Antelope Creek

The portions of Funks, Stone Corral, Grapevine, and Antelope creeks within the Sites Reservoir footprint are characterized by deeply incised channels that are largely devoid of riparian cover as a result of heavy cattle use. On the valley floor, Funks Creek and Stone Corral Creek flow through irrigated pasture, rice fields, and row crop agriculture until they flow into the Colusa Basin Drain. They are incised and riveted in some areas, and have been straightened and probably excavated to facilitate farming. During summer, much of the streambed of all of the Primary Study Area creeks is dry, except for occasional pools or when receiving agricultural drainage or runoff.

Table 12-12 identifies fish species found in Funks Creek, Stone Corral Creek, Grapevine Creek, and Antelope Creek in the proposed Sites Reservoir Inundation Area. These species were observed during sampling conducted between January 1998 and July 1999 (CDFG, 2003). Most of the fish sampled were less than six inches long, suggesting that juveniles rear in these creeks and move downstream to larger bodies of water as adults. Many of the native minnow species found in these creeks typically ascend seasonal creeks in winter and spawn there in early spring (Moyle, 2002). Most adults migrate downstream after spawning. One spring-run Chinook salmon carcass was observed in Antelope Creek during sampling (CDFG, 2003). Live Chinook salmon and Chinook salmon carcasses were also observed in Funks Creek downstream of Funks Reservoir. These fish likely strayed from the Sacramento River during high flows or migrated up the Yolo Bypass and through the Ridge Cut. Suitable Chinook salmon spawning habitat does not exist downstream of Funks Reservoir, and spawning habitat is not known to exist on Antelope Creek as water quality and hydraulic conditions are not suitable to support a population.

Table 12-12
Fish species observed by CDFG during sampling efforts in the Colusa Basin Drain

Common Name	Scientific Name
Central Valley Chinook salmon,	*Oncorhynchus tshawytscha*
White Catfish	*Ictalurus catus*
Brown Bullhead	*Ameiurus nebulosus*
Black Bullhead	*Ameiurus melas*
Channel Catfish	*Ictalurus punctatus*
Bluegill	*Lepomis macrochirus*
Green Sunfish	*Lepomis cyanellus*
Largemouth Bass	*Micropterus salmoides*
Black Crappie	*Pomoxis nigromaculatus*
White Crappie	*Pomoxis annularis*
Pacific Lamprey	*Lampetra ayresi*
Threadfin Sad	*Dorosoma petenense*
California roach	*Hesperoleucus symmetricus*
Hitch	*Lavinia exilicauda*
Fathead Minnow	*Pimephales promelas*
Common Carp	*Cyprinus carpio*
Goldfish	*Carassius auratus*
Sacramento Pikeminnow	*Ptychocheilus grandis*
Sacramento Blackfish	*Orthodon microlepidotus*
Sacramento Splittail	*Pogonichthys macrolepidotus*
Hardhead	*Mylopharodon conocephalus*
Sacramento Sucker	*Catostomus occidentalis*
Inland Silverside	*Menidia beryllina*

Table 12-12
Fish species observed by CDFG during sampling efforts in the Colusa Basin Drain

Common Name	Scientific Name
Mosquitofish	*Gambusia affinis*
Sculpin sp.	*Cottus sp.*
Tule Perch	*Hysterocarpus traski*
Big scale logperch	*Percina macrolepida*

Hunters Creek and the Colusa Basin Drain

The Delevan Pipeline would cross Hunters Creek near its confluence with the Colusa Basin Drain. This stream has not been sampled to determine which fish species are found there. Due to the similar hydrology, channel form, and riparian habitat, Hunters Creek likely has a species composition similar to the streams found in the Sites Reservoir footprint.

The Delevan Pipeline would also cross the Colusa Basin Drain. Historically, the Colusa Basin Drain was a natural channel that transported water from westside tributaries, such as Willow, Funks, Stone Corral, and Freshwater creeks, to the Sacramento River. It also carried floodwater from the Sacramento River. When agricultural operations began in the Sacramento Valley, the Colusa Basin Drain was channelized and dredged to carry agricultural runoff in addition to natural flows. Table 6 identifies the fish species observed during sampling efforts in the drain conducted between January and July 1999 (CDFG, 2003). Fall-, late-fall-, and spring-run Chinook salmon have also been observed in the Colusa Basin Drain. Steelhead may also be present, with potential spawning habitat existing upstream of the Primary Study Area in Willow Creek and Freshwater Creek, but none were captured during sampling efforts (CDFG, 2003).

T-C Canal and GCID Canal

The T-C Canal and the GCID Canal provide habitat for native and non-native fish species. Native fish that are common in the canals are Sacramento sucker, Sacramento pike minnow, hardhead, and hitch. Non-native fish species include striped bass, black bass, sunfish, and common carp. Many of the native fish that occur in the canals likely enter through the intakes as larvae (Reclamation, 2001). Existing screens at the pumping plants are designed to keep Chinook salmon and steelhead from entrainment in the pumps and canals.

Sacramento River at the Delevan Pipeline Intake Facilities, Red Bluff Pumping Plant, and GCID Pumping Plant

The reach of the Sacramento River at the proposed Delevan Pipeline Intake/Discharge Facilities, the existing Red Bluff Pumping Plant, and the existing GCID Pumping Plant provides habitat for migrating adult and juvenile Central Valley steelhead, and winter-, spring-, late-fall-, and fall-run Chinook salmon. Fall- and late-fall-run also spawn in the river near the Red Bluff Pumping Plant and have spawned as far down as the GCID Pumping Plant.

Adult, larval, and juvenile white and green sturgeon also migrate and hold in the vicinity of the proposed pumping plant and the existing Red Bluff and GCID pumping plants. White sturgeon likely spawn in the vicinity of the GCID Pumping Plant and proposed Delevan Pipeline Intake Facilities. Green sturgeon are known to spawn in the vicinity of the Red Bluff and GCID pumping plants (Poytress et al., 2011). It is not known if green sturgeon spawn farther downstream at the proposed Delevan Pipeline Intake/Discharge Facilities site, but tracking data indicates that green sturgeon do not hold in this area during the spawning period. Sturgeon egg and larva surveys have been conducted on the Sacramento River downstream of Jelly's Ferry Bridge (RM 266.5) to upstream of the GCID Pumping Plant (RM 206.5). Spawning has been confirmed (eggs have been collected) as far upstream as RM 264.5 (near Inks Creek) and as far downstream as RM 206.5 upstream of GCID Pumping Plant) (Poytress et al., 2009, 2011). DFG conducted juvenile salmonid monitoring at the location of the proposed Delevan Pipeline Intake Facilities and approximately one mile upstream of the Tisdale Weir (DFG, 2011c). Sampling showed that juvenile Chinook salmon do migrate past the site in the summer (August), but are most abundant during the winter months (December to February). Chinook salmon juveniles were most abundant during periods of high flow. Abundance decreased as flows receded. The abundance of fish passing the site also appeared to increase during periods of high turbidity (associated with relatively small increases in flow).

12.3 Environmental Impacts/Environmental Consequences

12.3.1 Regulatory Setting

Aquatic biological resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable aquatic resource laws and regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this DEIR/EIS.

12.3.1.1 Federal Plans, Policies, and Regulations

- Federal Endangered Species Act
- U.S. Fish and Wildlife Service Operations Criteria and Plan Biological Opinion
- National Marine Fisheries Service Operations Criteria and Plan Biological Opinion
- Clean Water Act
- Rivers and Harbors Act of 1899
- Central Valley Project Improvement Act
- National Environmental Policy Act
- Magnuson-Stevens Fishery Conservation and Management Act
- USFWS Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes
- National Marine Fisheries Service Recovery Planning for Salmon and Steelhead in California
- Fish and Wildlife Coordination Act
- Anadromous Fish Restoration Program
- CALFED Bay Delta Program
- National Invasive Species Act of 1996
- Trinity River Restoration Program
- Central Valley Project Long-term Water Service Contracts

12.3.1.2 State Plans, Policies, and Regulations

- California Endangered Species Act
- California Environmental Quality Act
- Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
- California Fish and Game Code Section 1602 - Streambed Alteration
- The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act
- Natural Community Conservation Planning Act
- California Fish and Game Code Sections 5937 and 5980-5993
- California Aquatic Invasive Species Management Plan

12.3.1.3 Regional and Local Plans, Policies, and Regulations

- Interagency Ecological Program Pelagic Organism Decline Studies
- Delta Vision Strategic Plan
- State Water Resources Control Board and California Environmental Protection Agency Draft Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem

12.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for biological resources:

Would the Project:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

The evaluation criteria used for impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the aquatic biological resources impact assessment, indicators (e.g., water temperatures, flows) were used to evaluate whether the Project would have an impact on a species’ habitat. The impact indicators and evaluation guidelines were developed based on an extensive review of fisheries literature, with special emphasis on research conducted in the Central Valley. Impact determinations were based on consideration of all evaluated impact indicators for all life stages for a particular species in a particular river or geographic region (e.g., the Delta, the Export Service Area). For the purposes of this analysis, an alternative would result in a significant impact if it would result in the following:

- A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

A detailed description of each of the species and location-specific impact indicators is provided in Appendix 12B.

12.3.3 Impact Assessment Assumptions and Methodology

12.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to aquatic biological resources:

- Direct Project-related construction and maintenance activities would occur in the Primary Study Area
- The only direct project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump in an existing bay at the Red Bluff Pumping Plant

- The only direct project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant)
- No direct project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct project-related operational effects would occur in both the Primary Study Area and the Secondary Study Area
- Direct project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation, increased reliability of water supply to agricultural, municipal, and industrial water users, and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.

12.3.3.2 Methodology

Detailed discussion of the impact assessment methodology, impact indicators, and significance criteria used to evaluate potential impacts of the alternatives on aquatic biological resources, relative to Existing Conditions and the No Project/No Action Alternative for regulatory compliance purposes, is provided in Appendix 12B.

For each of the study areas (i.e., Extended, Secondary, and Primary), the impact assessment identifies fish species of primary management concern. Species of primary management concern include special-status fish species (federal- and State- listed threatened and endangered, federal candidate species and species of concern, and State species of special concern), as well as other recreationally important species (e.g., striped bass and American shad).

Potential impacts on fish species of primary management concern were assessed by evaluating hydrologic and water temperature model outputs to identify changes in aquatic habitat that could potentially impact fish species of primary management concern. The impact assessments relied on model output data, including:

- Simulated riverine, reservoir, and Delta hydrology, and X2 location:
  - Appendix 6B – CALSIM II Modeling (includes overview of modeling framework)
  - Appendix 6C – River Flow Modeling (USRDOM)
  - Appendix 7D – Delta Modeling (DSM2)
- Simulated water temperatures:
  - Appendix 7E – River Temperature Modeling
  - Appendix 7F – Sites Reservoir Discharge Temperature Modeling
- Summarized simulated hydrology and water temperature data (Appendix 12E and Appendix 12F)

- Simulated fisheries habitat and population parameters:
  - Appendix 12G – Sacramento Splittail Usable Flooded Area Analyses
  - Appendix 12I – Delta Pumping Salvage and Entrainment Analysis
  - Appendix 12J – Early Life-Stage Salmon Mortality Modeling
  - Appendix 12K – Salmonid Population Modeling (SALMOD)
  - Appendix 12L – Winter Run Chinook Salmon Life Cycle Modeling (IOS)
  - Appendix 12M – Delta Passage Modeling (DPM)
  - Appendix 12N – Weighted Useable Area Analysis

Not every model output node location or output variable was evaluated. Specific model outputs and output locations evaluated varied by species based on individual species life history periodicities, habitat requirements, and geographic distributions.

A detailed description of the general and species-specific analytical methodologies, model output types, and model output locations used to assess potential impacts on fish species of primary management concern are provided in Appendix 12B. Potential impacts on aquatic biological resources in the Secondary Study Area are discussed in detail in Appendix 12C.

Although operation of the Project facilities is conceptually simple (see Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives), implementation of the action alternatives would alter reservoir operations throughout the SWP and CVP system in ways not necessarily observed historically or evaluated in previous environmental documents. Specifically, simulated average monthly flows and water temperatures frequently increase and decrease by small and large amounts within the same month and among months over the 82-year simulation period. These hydrologic and water temperature changes are easily observed in the model output data, but are difficult to evaluate with respect to fish species of primary management concern.

Mass balance hydrologic and water temperature modeling was performed to provide a quantitative basis from which to assess potential operations-related impacts of the alternatives on fish species of primary management concern and aquatic habitats within the Extended (e.g., San Luis Reservoir) and Secondary (e.g., Trinity, Clear Creek, Sacramento, Feather and American rivers, and the Delta) study areas, relative to the CEQA and NEPA bases of comparison (i.e., Existing Conditions and the No Project/No Action Alternative). Specifically, the hydrological modeling analyses were utilized to simulate data representing Central Valley Project/State Water Project (SWP/CVP) operational conditions that would occur with implementation of the alternatives, as compared to modeled data representing operational conditions for the CEQA and NEPA bases of comparison. Assessment of fish species of primary management concern in the Primary Study Area (e.g., Sites and Funks reservoirs) consisted primarily of evaluation of construction, operation, and maintenance impacts. Both quantitative and qualitative assessments were conducted to evaluate potential impacts to aquatic biological resources that could occur as a result of implementation of the proposed Project. The methodologies used to simulate comparative operational scenarios, and assumptions associated with the alternatives and bases of comparison are described in Appendix 6A and Appendix 6B.

The impact assessment of aquatic biological resources consisted of three primary elements, including: (1) temporary and localized impacts associated with construction of the proposed Project infrastructure facility components; (2) ongoing impacts associated with operation and maintenance of the proposed Project facilities; and (3) ongoing hydrologic changes associated with operation of each of the alternatives. The detailed analytical approaches used to assess the potential impacts of each of these primary elements of the alternatives are described in Appendix 12B.

12.3.3.3 Extended Study Area

The Extended Study Area consists of the SWP/CVP water service areas, San Luis Reservoir, and the Level 4 wildlife refuges located throughout the water distribution system.

For fisheries impact evaluation purposes, the focus of the analyses was placed on the National Wildlife Refuges (NWR) and San Luis Reservoir.

Level 4 National Wildlife Refuges

Changes to Level 4 water supply reliability could potentially affect fisheries resources in the wildlife refuges or in the water distribution systems within the refuges. Potential changes in water deliveries to individual refuges are not provided as part of the CALSIM II model output. However, implementation of the action alternatives would result in the provision of an alternate source of Level 4 water supply and would not affect supply reliability. Therefore, Level 4 water supply to these refuges was evaluated qualitatively under the alternatives, relative to the bases of comparison.

San Luis Reservoir

Coldwater and warmwater fisheries in San Luis Reservoir were evaluated using the same methodology that was used for the reservoirs included in the Secondary Study Area, as described below.

12.3.3.4 Secondary Study Area

The Secondary Study Area consists of the SWP and CVP water bodies and the waterways within the Sacramento River, Feather River, Trinity River, and American River watersheds that lie outside of the Primary Study Area described above. For fisheries impact evaluation purposes, the Secondary Study Area includes Trinity Lake, the Trinity River, Clear Creek, Shasta Lake, the Sacramento River downstream of Keswick Dam, Lake Oroville, the Feather River, Folsom Lake, Sutter Bypass, the American River, the Yolo Bypass, and the Sacramento-San Joaquin Delta.

General Assessment Approach

Because the alternatives may result in changes in water temperatures and river flows, as well as Delta habitat parameters (e.g., salinity) in the Secondary Study Area, the impact assessment focused on these and other habitat-based elements. Specifically, the analysis of potential impacts was conducted using an ecologically scaled hierarchy. Changes to aquatic ecosystem-level functions (e.g., flow, water temperature) that are relevant to multiple fish species were evaluated first. The results of these analyses were then used to conduct individual fish species evaluations using species-specific habitat requirements and species-specific evaluation tools to identify potential impacts on fish species of primary management concern.

Analytical Tools

The aquatic biological resources impact assessment relied on hydrologic modeling to provide a quantitative basis from which to assess the potential impacts of the alternatives on fish species of primary management concern and their associated habitats within the SWP/CVP system. Specifically, the hydrological modeling and post-processing applications were utilized to simulate operations expected to occur in SWP/CVP reservoirs and rivers, and the Delta, as a result of implementation of the alternatives.

Hydrologic simulation results of monthly river flows and end-of-month reservoir storages from CALSIM II provided a quantitative basis to assess the potential impacts of operations on fish species, relative to the CEQA and NEPA bases of comparison, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). These simulated results were then used as inputs to Reclamation's Water Temperature Models (Appendix 7E), which simulate monthly water temperature of the main river systems (Trinity, Sacramento, Feather, and American rivers) for the same simulation period. The Upper Sacramento River Daily Operations Model (USRDOM) and the Sacramento River Water Quality Model (SRWQM) were used to simulate daily flows and water temperatures in the upper Sacramento River. The Reclamation Water Temperature model results were used as inputs to Reclamation's Early Life Stage Chinook Salmon Mortality Model (Salmon Mortality Model) to estimate annual mortality rates for the embryonic life stage of Chinook salmon. Flows and water temperatures were also utilized as inputs to other analytical tools including IOS, SALMOD, and the SacEFT to estimate potential population-level impacts on various life stages and habitat for some Sacramento River fishes. Electrical conductivity (EC) in the Delta was simulated using the DSM 2.

Specific nodes (i.e.; model output locations representing generalized geographic locations) from hydrologic and water temperature model output for fisheries impact assessment purposes, as well as the types of model outputs for flows and water temperatures (e.g., cumulative probability exceedance distributions) are identified by river and species in Appendix 12B. Additionally, detailed discussion of specific modeling tools, the modeling assumptions used to characterize the NODOS Project Alternatives' operations, and the appropriate use of model output results is presented in Appendix 6A and Appendix 6B.

Model Output Parameters Evaluated

Several quantitative model output parameters were evaluated by simulating CVP and SWP operations for each of the alternatives and the bases of comparison, then comparing those outputs to one another to identify differences between each of the alternative outputs. These differences in model output parameters are indicative of habitat or fish population changes that could occur with implementation of each of the alternatives.

Raw model output data included:

- Monthly flow, end-of-month storage, end-of-month reservoir water surface elevation, X2 location, and Old and Middle River (OMR) reverse flows
- Daily flow in the upper Sacramento River
- Monthly water temperature
- Daily water temperature
- Spawning habitat availability (expressed as weighted useable area)

Raw model outputs listed above were conditioned to aggregate data in meaningful ways for aquatic biological resources evaluation purposes. Additionally, raw model outputs were utilized as inputs to Reclamation's Early Life Stage Chinook Salmon Mortality Model, other fish population models (IOS, SacEFT, and SALMOD), and other additional analytical tools (e.g., spreadsheet tools) that allowed for examination of specific habitat or fish population variables (e.g., spawning flow-dependent habitat availability, south Delta pumping facility fish salvage).

The following types of data products (i.e., conditioned raw model output data) were utilized for evaluating hydrologic and fisheries data:

- Long-term average flow, water temperature, end-of-month reservoir storage, Delta outflow, X2 location, and OMR reverse flows. These output parameters were evaluated by month over the entire period of record and by water year type.
- Exceedance probability distributions (exceedance curves) for flow, water temperature, storage, Delta outflow, X2 location, OMR reverse flows, and IOS production estimates by month. These exceedance probability distributions were developed from ranked and sorted data, and show the percentage of time (probability) that a given value is exceeded. Exceedance probability distributions were evaluated by month over the entire period of record and by water year type.
- Monthly flow-dependent habitat availability curves expressed as weighted useable area for evaluating Chinook salmon and steelhead spawning habitat availability. Flow-dependent habitat is expressed as weighted useable area (WUA) and was evaluated during the spawning months for the entire period of record.
- Monthly salvage density. This estimate of fish taken at the CVP and SWP pumping facilities is calculated by utilizing existing historical salvage densities and applying them to simulated exports at the facilities. Monthly salvage density was evaluated for the entire period of record and by water year type.
- Reclamation's Early Life Stage Chinook Salmon Mortality Model. Early life stage mortality was evaluated over the entire period of record and by water year type.
- SALMOD. Estimates of juvenile production for each run of Chinook salmon in the Sacramento River were evaluated over the entire period of record and by water year type.
- IOS, Delta Passage Model (DPM) and SacEFT. Outputs from IOS and SacEFT were evaluated over the entire period of record and by water year type.

Detailed discussion of models and data products utilized for the aquatic biological resources analyses is provided in Appendix 12B.

Quantitative Evaluation Criteria

Evaluation of potential impacts on fisheries resources included evaluating the net difference in a habitat variable for each of the alternatives, relative to a baseline condition. The habitat variables were evaluated over the entire model period of record (e.g., 82 years for CALSIM II), by water year type (e.g., wet years, above normal years, below normal years), and during the lowest 25 percent of years as defined by the exceedance probability distributions. However, individual model output parameters and data products were also evaluated quantitatively based on the type of parameter examined and the existence in scientific literature of biologically relevant relationships to the parameter. For example, flow is important to maintain aquatic life, but no identified quantitative relationship between flow during Chinook salmon immigration and spawning success exists for the Sacramento River. However, the body of literature does contain information about biological effects that occur to individuals (e.g., stress response) or groups of individuals (e.g., 50 percent mortality) associated with exposure to specific water temperatures. Thus, some model output parameters were evaluated using specific index values as impact indicators, while other parameters were evaluated utilizing criteria that were not necessarily empirically derived or reported in scientific literature as being associated with a specific biological effect. Detailed discussion of evaluation criteria is provided in Appendix 12B. Evaluation methods and assumptions for each of the model output parameters are described briefly below.

Flow, Storage, Delta Outflow

- Evaluate the net difference in the number of years when flows, storage, or Delta outflow are greater or less than 10 percent different with implementation of the alternatives, relative to a baseline condition
  - Changes of less than 1 percent are considered “noise” in the model
  - Changes between 1 and 10 percent are considered real, but not substantial
  - Changes greater than 10 percent are considered substantial

Water Temperature

- Evaluate the net difference in the number of years that specific index values are exceeded with implementation of the alternatives, relative to a baseline condition by comparing life stage specific water temperature index values to model output for each alternative
  - Changes less than 0.3°F are considered noise in the model

WUA Curves

- Evaluate differences between the percentage of maximum WUA between the alternatives and a baseline condition
  - Differences in percentage of maximum WUA of 1 percent or greater are considered meaningful

Early Life Stage Mortality, SALMOD, IOS, Delta Passage Model

- Evaluate absolute differences and relative differences (in percentage) with implementation of the alternatives, relative to a baseline condition over the period of record and by water year type
  - A substantial change in any of the model output metrics is considered to be a change of 10 percent or more

X2 Location

- Evaluate changes in X2 location of 1 km or more under an alternative, relative to a baseline condition (for species that don’t have specific X2 evaluations)
- Evaluate changes in X2 location between river kilometer (RKm) 65 and RKm 80 of 10 percent or more during September through December
- Fall X2 location is evaluated as an indicator of habitat suitability in this region of the Delta. However, because of the controversy surrounding the Fall X2 delta smelt rearing habitat suitability index described by Feyrer et al. (2010), the habitat suitability index was not used.
- Evaluate the frequency with which average monthly X2 location is maintained at or downstream of 75 km during April through June to evaluate potential effects on American shad eggs and larvae.

Water Surface Elevation

- Evaluate reductions in water surface elevation of six feet or more per month during the March through June warm water fish spawning period.

Old and Middle River (OMR) Reverse Flows

- Evaluate exceedance probability distributions to identify the percentage of time from March through June when OMR flows are less than -1,500 cfs[4] during dry and critical years to evaluate entrainment potential for delta smelt larvae.
- Evaluate the percentage of time from December through February when OMR flows are less than -5,000 cfs to evaluate entrainment potential for delta smelt adults and straying potential for San Joaquin River fall-run Chinook salmon adults.
- Evaluate the percentage of time from December through March when OMR flows are less than -5,000 cfs to evaluate entrainment potential for longfin smelt juveniles and adults.
- Evaluate changes in the frequency with which mean monthly OMR flows are greater than -1,500 cfs during April and May of dry and critical water years to evaluate entrainment potential for longfin smelt larvae.
- Evaluate percentage of time from November through June when OMR flows are less than 2,500 cfs to evaluate entrainment potential into the Central Delta for juvenile Chinook salmon.
- Evaluate percentage of time from October through July when OMR flows are reduced to evaluate entrainment potential into the Central Delta for juvenile steelhead.

Reservoir- and River-Specific Assessment Approach

Changes in SWP/CVP operations resulting from implementation of the alternatives could potentially alter seasonal flows and water temperatures in the Trinity River, Clear Creek, the Sacramento River, the Feather River, the American River, and the Delta.

The river-specific fisheries impact assessment focused on the hydrologic changes, including reservoir water surface elevation, storage, and instream flows and water temperatures associated with implementation of the alternatives. Taking into account species-specific habitat requirements, operational components of the alternatives were assessed to evaluate potential impacts on identified fish species of primary management concern and associated aquatic habitat.

Because the fish species that inhabit, traverse, or utilize these areas could differ among regions, the fisheries impact assessment approach varied among geographic areas. Further, information available from modeling efforts differed among rivers. Therefore, the river-specific impact assessment included identification of fish species of primary management concern, model output and node locations, and species and life stage-specific evaluation methodologies for the alternatives.

Where specific flow requirements have not been developed for species evaluated in a specific river, potential flow-related impact determinations were based on an evaluation of the frequency and magnitude of change in modeled monthly mean flow for the alternatives, relative to the bases of comparison (Existing Conditions and the No Project/No Action Alternative). Impact determinations related to water temperature were based on species and life stage-specific water temperature impact indicator values

[4] Negative Old and Middle river flows imply that the average flow in Old and Middle Rivers is reversed and the flow is towards the south Delta pumps.

(presented in Appendix 12B and with detailed description of literature describing index value selection criteria presented in Appendix 12D).

Trinity, Shasta, Oroville, and Folsom Reservoirs

Implementation of the alternatives could potentially result in alterations to storage volumes and water surface elevations in Trinity, Shasta, Oroville, and Folsom reservoirs, which could potentially affect reservoir fish species. Model output parameters derived from CALSIM II used to determine potential impacts included:

- End-of-month (average annual monthly) reservoir storage volume
- End-of-month (average annual monthly) water surface elevations.

During the period when these reservoirs are thermally stratified (generally April through November), coldwater fish within the reservoir reside primarily within the reservoir's metalimnion[5] and hypolimnion[6] where water temperatures remain suitable. Reduced reservoir storage during this period could reduce the reservoir's coldwater pool volume, thereby reducing the quantity of habitat available to coldwater fish species during these months. Reservoir coldwater pool size generally decreases as reservoir storage decreases, although not always in direct proportion because of the influence of reservoir basin shape. Therefore, to assess potential storage-related impacts on coldwater fish habitat availability in Trinity, Shasta, Oroville, and Folsom reservoirs, end-of-month storage simulated for the alternatives were compared to end-of-month storage simulated for the bases of comparison for each month of the April through November period.

Because reservoir warmwater fish species[7] use the warm upper layer of the reservoir and nearshore littoral habitats, seasonal changes in reservoir storage, as it affects reservoir water surface elevation, and the rates at which water surface elevation change during specific periods of the year, can directly affect warmwater fish nesting and spawning success. To assess the impacts of potential reservoir water surface elevation changes on warmwater fish, the following approach was used. The magnitude of change, as measured in feet with reference to mean sea level (feet msl), in reservoir water surface elevation occurring each month of the primary spawning period for nest-building fish (March through June) simulated for the alternatives was determined and compared to the bases of comparison. Specifically, the number of times that reservoir reductions of six feet or more per month could occur with implementation of the alternatives was compared to the number of occurrences of the same modeled for the bases of comparison.

A detailed description of the specific methods utilized to evaluate coldwater and warmwater fish species in each of the existing reservoirs potentially affected by implementation of the alternatives is provided in Appendix 12B.

Trinity River

Project operations are not expected to substantially alter instream flows, water temperatures, or habitat conditions for fish inhabiting the Trinity River. However, as part of the impact assessment, modeling

[5] thermocline; thin, distinct layer that separates regions differing in temperature
[6] below thermocline; dense, bottom layer of water
[7] Largemouth bass are evaluated as an indicator species in this EIR/EIS analysis to reflect potential impacts on warmwater game fishes.

results were reviewed and an analysis conducted on seasonal flows, water temperatures, and habitat availability in the Trinity River.

Changes in SWP/CVP operations associated with implementation of the alternatives could potentially alter instream flow and seasonal water temperatures in the Trinity River below Lewiston Reservoir and adversely affect Trinity River fish species. CALSIM II was used to evaluate potential impacts associated with changes in flow, and Reclamation's Water Temperature Model was used to assess water temperatures in the Trinity River. Additionally, Reclamation's early life stage mortality model was used to evaluate water temperature-related mortality on fall-run Chinook salmon in the Trinity River.

A detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in the Trinity River, is provided in Appendix 12B.

Clear Creek

Water operations in Clear Creek, including diversions to Clear Creek from the Trinity River, are components of the integrated operations of the Trinity River Division CVP system. From Whiskeytown Lake, water is released through the Spring Creek Power Conduit to the Spring Creek Powerplant and into Keswick Reservoir (up to 2,000 cfs). As part of the CVP system, implementation of one of the alternatives has the potential to affect Clear Creek flows and water temperatures, thereby potentially affecting habitat for species of primary management concern.

Changes in SWP/CVP operations associated with the alternatives could potentially alter instream flow and seasonal water temperatures in the Clear Creek below Whiskeytown Dam and adversely affect Clear Creek fish species. Therefore, CALSIM II was used to evaluate potential impacts associated with changes in flow, and Reclamation's Water Temperature Model was used to assess water temperatures.

Detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in Clear Creek, is provided in Appendix 12B.

Sacramento River

Shasta Reservoir releases, and therefore, Sacramento River flow, often are governed by water temperature requirements below Keswick Dam for April through October, and an end-of-September minimum carryover storage for Shasta Reservoir of 1.9 million acre feet (MAF) to protect Sacramento River winter-run Chinook salmon. To meet the temperature objectives, a dynamic evaluation of ambient air temperature, weather forecasts, water temperature at the release point, and release rate occurs. Determination of the appropriate release rate is often made based on the temperature of the water released rather than on the rate needed to support CVP operations.

While water temperature and carryover storage targets for winter-run Chinook salmon generally govern Shasta Reservoir releases, the Sacramento River below Keswick Dam is utilized by a number of fish species of management concern, either as habitat during one or more of their life stages, or as a migration corridor to available habitat in Sacramento River tributaries. Changes in SWP/CVP operations resulting from implementation of the alternatives could potentially alter seasonal flows and water temperatures in the Sacramento River, which in turn could affect the relative habitat availability for fish species that are present in the Sacramento River.

The potential for changes in flows and water temperatures resulting from implementation of one of the alternatives to impact fish resources of the Sacramento River are dependent on the species-specific habitat and physiological requirements. Therefore, species-specific flow and water temperature methodologies for the Sacramento River fisheries assessment are discussed in detail in Appendix 12B. The following tools were utilized for analyses of specific habitat variables:

- CALSIM II – Flow
- Reclamation Water Temperature Model – Water Temperature
- Reclamation Early Life Stage Mortality Model – Chinook salmon early life stage mortality
- Flow-Habitat Relationships – Chinook salmon spawning WUA
- SALMOD – Chinook salmon population mortality and production potential
- IOS/DPM – Winter-run Chinook salmon population survival and female spawner abundance
- SacEFT – Steelhead spawning habitat availability, egg-to-fry survival, nest (redd) dewatering, redd scour, juvenile stranding, and juvenile rearing habitat; green sturgeon water temperature-related egg mortality

A detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in the Sacramento River, is provided in Appendix 12B.

Feather River

Because implementation of the alternatives may result in changes to Feather River flows and water temperatures, the impact assessment focuses on these and other habitat-based elements. Taking into account species-specific habitat requirements, operational components of the alternatives were assessed to evaluate potential impacts on identified fish species of primary management concern and associated aquatic habitat.

The potential for changes in flows and water temperatures resulting from implementation of the alternatives to impact fish resources of the Feather River are dependent on the species-specific habitat and physiological requirements. Therefore, species-specific flow and water temperature methodologies for the Feather River fisheries assessment are discussed in detail in Appendix 12B. The following tools were utilized for analyses of specific habitat variables:

- CALSIM II – Flow
- Reclamation Water Temperature Model – Water Temperature
- Reclamation Early Life Stage Mortality Model – Chinook salmon early life stage mortality
- Flow-Habitat Relationships – Chinook salmon and steelhead spawning WUA

A detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in the Feather River, is provided in Appendix 12B.

Sutter Bypass

To determine potential impacts on fish species of primary management concern potentially utilizing the Sutter Bypass, flows available from USRDOM were evaluated at Ord Ferry and Moulton, Colusa, and Tisdale weirs.

Detailed description of the specific methods utilized to evaluate species of primary management concern in the Sutter Bypass is provided in Appendix 12B.

American River

Because implementation of the alternatives may result in changes to American River flows and water temperatures, the impact assessment focused on the hydrologic changes associated with implementation of the alternatives.

Flows and water temperatures in the American River are controlled by operations of Folsom Reservoir. The impact evaluation on fishery resources requires an understanding of fish species' life histories and life stage-specific environmental requirements (see Affected Environment discussion), and the ability to meet them in the American River.

The potential for changes in flows and water temperatures resulting from implementation of one of the alternatives to impact fish resources of the American River are dependent on the species-specific habitat and physiological requirements. Therefore, species-specific flow and water temperature assessment methodologies for the American River fisheries assessment are discussed in detail in Appendix 12B. The following tools were utilized for analyses of specific habitat variables:

- CALSIM II – Flow
- Reclamation Water Temperature Model – Water Temperature
- Reclamation Early Life Stage Mortality Model – Fall-run Chinook salmon early life stage mortality
- Flow-Habitat Relationships – Fall-run Chinook salmon and steelhead spawning WUA

A detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in the American River, is provided in Appendix 12B.

Sacramento-San Joaquin Delta and Yolo Bypass

The alternatives have the potential to influence aquatic habitat conditions by potentially altering Delta inflow and water export operations. Therefore, aquatic habitat conditions and export operations (e.g., fish salvage operations) were evaluated to identify potential impacts on Delta species of primary management concern.

Because the alternatives have the potential to influence aquatic habitat conditions by potentially altering Delta inflow and water export operations, the following were evaluated:

- Water temperature
  - Water temperatures derived from Reclamation's Water Temperature Model in the lower reaches of the Sacramento River were used because Delta water temperatures from the DSM2 model were not available.
- Delta outflow
- X2 location
- Old and Middle River reverse flows
- Fish salvage and entrainment loss

Detailed description of the specific methods, including life stage periodicity and model output node locations utilized to evaluate species of primary management concern in the Sacramento-San Joaquin Delta, is provided in Appendix 12B. A detailed description of the methods and results of the fish salvage and entrainment loss modeling are provided in Appendix 12I.

In addition to the variables described above, the Delta Passage Model (DPM) was utilized to evaluate survival of Chinook salmon through the Yolo Bypass and the Delta. Additional detail regarding the DPM is provided in Appendix 12M.

The Yolo Bypass also was evaluated using CALSIM II flows for those species potentially utilizing the Yolo Bypass for spawning and rearing.

12.3.3.5 Primary Study Area

The Primary Study Area is comprised of the locations where the following proposed facilities would be constructed, modified, and/or operated: (1) the Sites Reservoir and associated facilities including the Holthouse Reservoir Complex, the TRR and associated facilities, and the Delevan Pipeline and associated facilities; (2) the Delevan Pipeline intake and discharge facilities on the Sacramento River; (3) the T-C Canal and Red Bluff Pumping Plant intake facility on the Sacramento River; and (4) the GCID Canal and intake facility on the Sacramento River.

Construction-Related Impacts

Construction-related impacts were evaluated for the new intake structure and pipeline, for infrastructure modifications at the existing points of diversion and conveyance, as well as for potentially affected water bodies in the immediate project vicinity of the proposed Sites Reservoir. The impact mechanisms evaluated for construction-related impacts included:

- Erosion, sedimentation, and turbidity
- Hazardous materials and chemical spills
- Aquatic habitat modification
- Hydrostatic pressure waves, noise, and vibration
- Stranding and entrainment potential
- Entrainment risk
- Fish passage
- Direct physical injury and/or mortality.

Within the Primary Study Area, NODOS Project construction-related impacts could potentially occur through direct contact of construction personnel, equipment, and/or debris, and generally would be limited to the area in the immediate vicinity of the construction footprint, and short distances downstream.

Potential construction-related impacts to resident and anadromous fisheries resources and aquatic habitat would depend on:

1. Location and type of infrastructure component to be constructed
2. Proximity of construction access routes, staging areas, and storage and disposal areas to waterways
3. Timing of construction activities
4. Specific techniques used

5. Potential for construction-related activities to directly harm individuals and/or remove, damage, or alter onsite habitat conditions within and adjacent to the construction footprint
6. Specific minimization and avoidance measures implemented before, during, and after construction

For each proposed project infrastructure component, the assessment was based on several considerations, including the duration and extent of construction-related activities, as well as the proximity of construction-related activities to waterways. Construction-related impacts could include: (1) changes in aquatic habitat quantity and quality; (2) changes in aquatic and riparian vegetation; and (3) changes in the composition of predator and prey fish community interactions within the immediate NODOS facility footprint area.

Detailed discussion of assessment methodology for the Primary Study Area is provided in Appendix 12B.

Operations- and Maintenance-related Impacts

The impact assessment methodology for the Primary Study Area addressed the operations and maintenance of Sites Reservoir facilities, Holthouse Reservoir Complex facilities, and the three points of diversion on the Sacramento River. The impact mechanisms evaluated for operations-related impacts included fish screen impingement and entrainment associated with water diversions, and temperature effects to the Sacramento River, resulting from Sites Reservoir releases. A detailed description of the assessment methodologies utilized to evaluate potential operations and maintenance impacts on aquatic biological resources is provided in Appendix 12B.

12.3.4 Topics Eliminated From Further Analytical Consideration

Several SWP/CVP re-regulating reservoirs that are located within the Secondary Study Area, including Lewiston Lake downstream of Trinity Dam, Whiskeytown Lake downstream of Lewiston Dam, Keswick Reservoir downstream of Shasta Dam, the Thermalito Complex downstream of Oroville Dam, and Lake Natoma downstream of Folsom Dam, have been eliminated from consideration for these analyses. No storage- or elevation-related impacts on fishery resources in these reservoirs are expected to occur with implementation of the alternatives, relative to the bases of comparison. As regulating afterbays, the re-regulating reservoirs are operated to receive highly variable flows and, as a result, monthly storage and elevation fluctuate significantly on a daily and hourly basis. Therefore, changes in releases from upstream reservoirs under the alternatives would not affect monthly mean storage or elevation, relative to the CEQA or NEPA baseline conditions. Consequently, no assessment of potential storage- or elevation-related impacts on biological aquatic resources in re-regulating reservoirs is warranted.

The following facilities within the Primary Study Area were not evaluated in detail because they would not be located within or adjacent to a waterway; therefore construction, operation, or maintenance of these facilities would not be anticipated to affect aquatic biological resources:.

- Recreation Areas
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Terminal Regulating Reservoir (TRR)
- GCID Canal Connection to the TRR
- TRR Pumping/Generating Plant

- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Transmission Line
- Delevan Pipeline Electrical Switchyard

12.3.5 Impacts Associated with the No Project/No Action Alternative Relative to Existing Conditions

The fourteen proposed projects that are included in the No Project/No Action Alternative and their associated potential impacts to aquatic biological resources within the three study areas are summarized below.

12.3.5.1 DWR - Mayberry Farms Subsidence Reversal and Carbon Sequestration Project

The creation of permanently flooded wetlands on Sherman Island associated with the Mayberry Farms Subsidence Reversal and Carbon Sequestration Project could increase local food availability, which could benefit aquatic species.

12.3.5.2 CCWD - Contra Costa Canal Fish Screen Project

Installation of fish screens at the Rock Slough diversion associated with the Contra Costa Canal Fish Screen Project is expected to minimize the entrainment losses of fish species in the Delta, which could benefit fisheries resources. Improvements at the diversion site also would potentially reduce predation on fish species.

12.3.5.3 CCWD, Reclamation, and DWR - Middle River Intake and Pump Station

Construction of the Alternative Intake Project would result in the installation of a new intake in the Delta, which could result in changes to local hydrodynamics and entrain or impinge fish species, as well as increase susceptibility of fish species to predation near the intake.

12.3.5.4 DWR – Federal Energy Regulatory Commission License Renewal for Oroville Project

Relicensing of the Oroville Facilities could result in operational changes in hydrology of Oroville Reservoir, Thermalito Afterbay, and the Feather River, which could affect aquatic biological resources in these locations. Effects of relicensing activities on reservoir storage and surface elevations, as well as Feather River flows and temperatures, are included in the assumptions associated with the hydrologic model simulations of the No Project/No Action Alternative. Therefore, operations-related effects on aquatic biological resources resulting from Oroville Facilities Relicensing efforts are evaluated below in conjunction with other No Project/No Action Alternative operations-related effects.

12.3.5.5 Freeport Regional Water Authority and Reclamation - Freeport Regional Water Project

Construction of both a new water intake facility/pumping plant on the Sacramento River and a 17-mile underground water pipeline within Sacramento County in association with the Freeport Regional Water Project could result in entrainment and impingement of fish species and result in changes in flow-dependent habitat availability downstream of the intake facility. Operation of the facility is included in the hydrologic model assumptions and potential effects on aquatic habitat are evaluated using hydrologic model results.

12.3.5.6 Reclamation District 2093 - Liberty Island Conservation Bank

Conservation and restoration of aquatic habitat at Liberty Island associated with the Liberty Island Conservation Bank is expected to provide additional habitat for native Delta fish species and anadromous fish species, which could provide for increased foraging and rearing habitat availability, and potentially result in increased survival of Delta and anadromous fish species.

12.3.5.7 City of Stockton - Delta Water Supply Project

Diversion of water from the Delta associated with the Delta Water Supply Project could result in changes in local hydrodynamics causing an increase in susceptibility of fish species to predation, and the possibility of entrainment or impingement of fish species.

12.3.5.8 Reclamation and SWRCB - Battle Creek Salmon and Steelhead Restoration Project

Restoration of salmonid habitat along Battle Creek and its tributaries due to changes in instream flows, removal of diversion dams, and construction of fish ladders and fish screens at other diversion dams associated with the Battle Creek Salmon and Steelhead Restoration Project is anticipated to improve and expand salmonid spawning, rearing, and migration habitat. This may result in increased abundance, productivity, and diversity, as well as improved spatial structure, of anadromous salmonid populations in Battle Creek.

12.3.5.9 Tehama Colusa Canal Authority and Reclamation - Red Bluff Diversion Dam Fish Passage Improvement Project

Modification of the Red Bluff Diversion Dam associated with the Red Bluff Diversion Dam Fish Passage Improvement Project is anticipated to reduce or minimize impacts on migration of anadromous fish species. The four-month “gates in” operation (May 15 through September 15) is expected to be discontinued once the new pumping plant is completed in 2012.

12.3.5.10 Reclamation, CDFG, and Natomas Central Mutual Water Company - American Basin Fish Screen and Habitat Improvement Project

This project involves modifications to the Natomas Central Mutual Water Company and other private water diversions on the Sacramento River and Natomas Cross Canal associated with the American Basin Fish Screen and Habitat Improvement Project, including installation of one or two positive-barrier fish screen diversion facilities; decommissioning and removal of the Verona Diversion Dam and lift pumps; removal of five pumping plants and one small private diversion; and modification of the existing distribution system. These activities are anticipated to reduce or minimize entrainment of juvenile fishes at these water diversions.

12.3.5.11 Reclamation – Delta-Mendota Canal/California Aqueduct Intertie

Construction of an intertie between the Delta-Mendota Canal and the California Aqueduct is anticipated to provide greater operational flexibility for the SWP and CVP, which could benefit Delta fish species.

12.3.5.12 Reclamation, USACE, SAFCA, and CVFPB - Folsom Dam Safety and Flood Damage Reduction Project

Dam safety and flood control improvements at Folsom Dam associated with the Folsom Dam Safety and Flood Damage Reduction Project are not anticipated to substantially affect fisheries resources.

12.3.5.13 Yolo County - Yolo County General Plan Update

Additional residential and commercial growth in Yolo County (within the Central Valley and along the Sacramento River within the Delta) is provided for under the Yolo County General Plan. This growth could result in indirect water quality-related effects on aquatic biological resources, due to potential increases in stormwater runoff into the Sacramento River and the Delta from new development. Effects associated with discrete development projects will be evaluated individually during the environmental review process for each of those potential development projects.

12.3.5.14 Zone 7 Water Agency and DWR - South Bay Aqueduct Improvement and Enlargement Project

Improvement and expansion of the South Bay Aqueduct associated with the South Bay Aqueduct Improvement and Enlargement Project is not anticipated to substantially affect aquatic biological resources.

A summary of changes in aquatic habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area resulting from implementation of the No Project/No Action Alternative, relative to Existing Conditions, is presented in Table 12-13. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas resulting from implementation of the No Project/No Action Alternative, relative to Existing Conditions, is presented in Table 12-14. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.5.15 Extended and Secondary Study Areas – No Project/No Action Alternative

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Potential impacts on reservoir coldwater fish species associated with implementation of the No Project/No Action Alternative were evaluated in Trinity, Shasta, Oroville, and Folsom reservoirs in the Secondary Study Area; and in San Luis Reservoir and other export service area reservoirs in the Extended Study Area. Within the Secondary Study Area and San Luis Reservoir in the Extended Study Area, reservoir storage was evaluated. Within the Extended Study Area, SWP and CVP exports were evaluated as an indicator of potential changes to export service area reservoirs.

Reservoir coldwater fish species habitat conditions for the No Project/No Action Alternative would be similar to Existing Conditions in Shasta and San Luis reservoirs. In Trinity Reservoir, the expected slightly increased end-of-month storages indicate improved coldwater reservoir fish species habitat conditions. However, habitat conditions in Oroville and Folsom reservoirs would be slightly less suitable as a result of slightly decreased reservoir storages. Similarly, export service area reservoir habitat conditions are anticipated to be slightly less suitable because patterns of Delta exports would change and would be reduced more frequently, and would be reduced by 10 percent or more during some months of critical years. Additionally, although exports would increase slightly most of the time during six months of the year, and decrease slightly during the remaining six months of the year, large decreases in exports would also occur, which could potentially result in large reductions in storage during some years.

Reservoir coldwater fish species are not considered state or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, potential impacts on reservoir coldwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis and other export service area reservoirs are considered **less than significant**.

Reservoir Warmwater Fish Species

Potential impacts on reservoir warmwater fish species associated with implementation of the No Project/No Action Alternative were evaluated in Trinity, Shasta, Oroville, and Folsom reservoirs in the Secondary Study Area; and in San Luis Reservoir and other export service area reservoirs in the Extended Study Area. Within the Secondary Study Area and San Luis Reservoir in the Extended Study Area, net changes in water surface elevation reductions of 6-feet or more during the warmwater fish nesting season were evaluated. Within the Extended Study Area, SWP and CVP exports were evaluated as an indicator of potential changes to export service area reservoirs.

Reservoir warmwater fish species habitat conditions for the No Project/No Action Alternative would be similar to Existing Conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs. However, export service area reservoir habitat conditions are anticipated to be slightly less suitable for reasons described for coldwater reservoir fish species, above.

Reservoir warmwater fish species are not considered state or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis and other export service area reservoirs.

Southern Oregon/Northern California Coho Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Southern Oregon/Northern California Coho salmon were evaluated only in the Trinity River. Flows and water temperatures were evaluated to identify potential changes in Trinity River habitat conditions that could potentially impact Coho salmon.

In general, habitat conditions in the Trinity River would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on Coho salmon in the Trinity River.

Upper Klamath-Trinity River Fall-Run and Spring-Run Chinook Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Upper Klamath-Trinity River fall-run and spring-run Chinook salmon were evaluated only in the Trinity River. Flows and water temperatures were evaluated to identify potential changes in Trinity River habitat conditions that could potentially impact Upper Klamath-Trinity River fall-run and spring-run Chinook salmon. Additionally, water temperature-related early life stage mortality was evaluated using Reclamation's Early Life Stage Mortality Model.

In general, during the periods when Chinook salmon are present in the Trinity River, habitat conditions, as well as early life stage mortality, would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on spring-run and fall-run Chinook salmon in the Trinity River.

Klamath Mountains Province Steelhead

Potential impacts associated with implementation of the No Project/No Action Alternative on Klamath Mountains Province steelhead were evaluated only in the Trinity River. Flows and water temperatures were evaluated to identify potential changes in Trinity River habitat conditions that could potentially impact steelhead.

In general, during the periods when steelhead are present in the Trinity River, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on steelhead salmon in the Trinity River.

Sacramento River Winter-Run Chinook Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Sacramento River winter-run Chinook salmon were evaluated in the Sacramento River, Sutter Bypass, Delta, and Suisun, San Pablo, and San Francisco bays (bays). Flows, water temperatures, and spawning habitat availability were evaluated to identify potential changes in habitat conditions at various locations. Additionally, water temperature-related early life stage mortality, population mortality, production potential, population survival, and female spawner abundance were evaluated using various modeling tools. Through-Delta survival was evaluated using the Delta Passage Model component of IOS.

In general, during periods when winter-run Chinook salmon are present in the Sutter Bypass, Delta, and bays downstream of the Delta, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. Habitat conditions in the Sacramento River would be similar but slightly less suitable as a result of slightly less suitable spawning and embryo incubation conditions more often. However, slightly less suitable conditions in the Sacramento River would not result in substantial effects because reductions in habitat suitability would be small in magnitude and occur relatively infrequently (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on winter-run Chinook salmon in the Sacramento River, Sutter Bypass, Delta, and the bays.

Central Valley Spring-Run Chinook Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Central Valley spring-run Chinook salmon were evaluated in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Delta, and bays. Flows, water temperatures, and spawning habitat availability were evaluated to identify potential changes in habitat conditions at various locations. Additionally, water temperature-related early life stage mortality, and population mortality and production potential, were evaluated using various modeling tools. Through-Delta survival was evaluated using the Delta Passage Model.

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in Clear Creek would be slightly improved during all life stages due to increased flows and decreased water temperatures occurring more frequently under the No Project/No Action Alternative, relative to Existing Conditions (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on spring-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Delta, and the bays.

Central Valley Fall-Run Chinook Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Central Valley fall-run Chinook salmon were evaluated in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Delta, and bays. Flows, water temperatures, spawning habitat availability, and OMR reverse flows were evaluated to identify potential changes in habitat conditions at various locations. Additionally, water temperature-related early life stage mortality, and population mortality and production potential, were evaluated using various modeling tools. Through Delta survival was evaluated using the Delta Passage Model.

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in Clear Creek would be slightly improved during all life stages due to increased flows and decreased water temperatures occurring more frequently. Additionally, habitat conditions in the American River would be substantially less suitable during all life stages (see Appendix 12C for a detailed discussion). Specifically, decreased flows and increased water temperatures, as well as increased early life stage mortality would occur more frequently, as a result of implementation of the No Project/No Action Alternative.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on fall-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Delta, and bays**,** but **there would be a potentially substantial adverse effect** on fall-run Chinook salmon in the American River.

Central Valley Late Fall-Run Chinook Salmon

Potential impacts associated with implementation of the No Project/No Action Alternative on Central Valley late fall-run Chinook salmon were evaluated in the Sacramento River, Clear Creek, Sutter Bypass, Delta, and bays. Flows, water temperatures, and OMR reverse flows were evaluated to identify potential changes in habitat conditions at various locations. Additionally, water temperature-related early life stage mortality, and population mortality and production potential, were evaluated using various modeling tools. Through-Delta survival was evaluated using the Delta Passage Model.

In general, during periods when late fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. Additionally, habitat conditions in Clear Creek would be generally similar or improved during all life stages due to increased flows and decreased water temperatures occurring more frequently (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on late fall-run Chinook salmon in the Sacramento River, Clear Creek, Sutter Bypass, Delta, and bays.

Central Valley Steelhead

Potential impacts associated with implementation of the No Project/No Action Alternative on Central Valley steelhead were evaluated in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays. Flows, water temperatures, Delta outflow, and OMR flows were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated. Additionally, spawning, embryo incubation, and juvenile rearing and emigration conditions in the Sacramento River were evaluated using SacEFT, and spawning habitat availability in the Feather River was evaluated using flow-habitat relationships.

In general, during periods when steelhead are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions as a result of increased flows and decreased water temperatures occurring more frequently. Additionally, habitat conditions in the American River would be substantially less suitable for juvenile rearing and emigration, and smolt emigration, as a result of decreased flows and increased water temperatures occurring more frequently, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on steelhead in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays**,** but **there would be a potentially substantial adverse effect** on steelhead in the American River.

Green Sturgeon

Potential impacts associated with implementation of the No Project/No Action Alternative on green sturgeon were evaluated in the Trinity River, Sacramento River, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays. Flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated. Additionally, water temperature-related egg survival in the Sacramento River was evaluated using SacEFT.

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable during all life stages due to decreased flows and increased water temperatures occurring more frequently, particularly during low flow conditions (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on green sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays, but **there would be a potentially substantial adverse effect** on green sturgeon in the American River.

White Sturgeon

Potential impacts associated with implementation of the No Project/No Action Alternative on white sturgeon were evaluated in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays. Flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when white sturgeon are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

White sturgeon are not considered State or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on white sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays**.**

Pacific Lamprey

Potential impacts associated with implementation of the No Project/No Action Alternative on Pacific lamprey were evaluated in the Trinity River, Sacramento River, Clear Creek, Feather River, American River, Delta, and bays. Flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when Pacific lamprey are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions as a result of increased flows occurring more often. Additionally, habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows and increased water temperatures occurring more frequently, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Pacific lamprey are not considered special status species in California, but are evaluated because the USFWS in Oregon and Washington considers Pacific lamprey to be a species of concern. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse**

effect on Pacific lamprey in the Trinity River, Sacramento River, Clear Creek Feather River, Delta, and bays**,** but **there would be a potentially substantial adverse effect** on Pacific lamprey in the American River**.**

River Lamprey

Potential impacts associated with implementation of the No Project/No Action Alternative on river lamprey were evaluated in the Sacramento River, Clear Creek, Feather River, American River, Delta, and bays. Flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when river lamprey are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions as a result of increased flows occurring more often. Additionally, habitat conditions in the American River would be substantially less suitable for all life stages, due to decreased flows and increased water temperatures occurring more frequently, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on river lamprey in the Sacramento River, Clear Creek, Feather River, Delta, and bays are considered **less than significant,** but **there would be a potentially substantial adverse effect** on river lamprey in the American River.

Hardhead

Potential impacts associated with implementation of the No Project/No Action Alternative on hardhead were evaluated in the Sacramento River, Clear Creek, Feather River, and American River. Flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations.

In general, during periods when hardhead are present in the Sacramento and Feather rivers, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. Habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions due to increased flows occurring more often. Additionally, habitat conditions in the American River would be similar during spawning but less suitable for other life stages due to decreased flows occurring more frequently (see Appendix 12C for a detailed discussion). However, because habitat conditions during spawning would be similar, and reduced habitat suitability for other life stages would be a result of decreased flows occurring more frequently while water temperatures remain within the range considered suitable, reduced flows alone would not be anticipated to result in a substantial effect on the population.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on hardhead in the Sacramento River, Clear Creek, Feather River, and American River.

California Roach

Potential impacts associated with implementation of the No Project/No Action Alternative on roach were evaluated in the Sacramento River, Clear Creek, Feather River, and American River in the Secondary Study Area, and in Level 4 wildlife refuges in the Extended Study Area. Within the Extended Study Area, habitat conditions were evaluated based on anticipated conditions resulting from implementation of the

No Project/No Action Alternative. Within the Secondary Study Area, simulated flows and water temperatures were evaluated to identify potential changes in habitat conditions at various locations.

Within the Secondary Study Area, during periods when roach are present in the Sacramento and Feather rivers, habitat conditions generally would be similar under the No Project/No Action Alternative, relative to Existing Conditions. Habitat conditions in Clear Creek would be similar during most years, but would be more suitable for spawning during low flow conditions as a result of increased flows occurring more often. Additionally, habitat conditions in the American River would be similar during spawning but less suitable for other life stages due to decreased flows occurring more often (see Appendix 12C for a detailed discussion). However, because habitat conditions during spawning would be similar, and reduced habitat suitability for other life stages would be a result of decreased flows occurring more frequently while water temperatures remain within the range considered suitable, reduced flows alone would not be anticipated to result in a substantial effect on the population. Habitat conditions within the Extended Study Area are anticipated to be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on California roach in the Sacramento River, Clear Creek, Feather River, American River, and Level 4 wildlife refuges.

Delta Smelt

Potential impacts associated with implementation of the No Project/No Action Alternative on delta smelt were evaluated in the Yolo Bypass, Delta (some analyses included model nodes in the lower reaches of the Sacramento River), and bays. Flows, water temperatures, X2 location, Delta outflow, salvage and entrainment, and OMR flows were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when delta smelt are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on delta smelt in the Yolo Bypass, Delta, and bays.

Longfin Smelt

Potential impacts associated with implementation of the No Project/No Action Alternative on longfin smelt were evaluated in the Delta (some analyses included model nodes in the lower reaches of the Sacramento River), and bays. Flows, water temperatures, X2 location, Delta outflow, salvage and entrainment, and OMR flows were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when longfin smelt are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions.

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on longfin smelt in the Delta and bays.

Sacramento Splittail

Potential impacts associated with implementation of the No Project/No Action Alternative on splittail were evaluated in the Feather River, American River, Sutter Bypass, Yolo Bypass, and Delta in the

Secondary Study Area; and in Level 4 wildlife refuges in the Extended Study Area. Extended Study Area habitat conditions were evaluated based on anticipated conditions resulting from implementation of the No Project/No Action Alternative. Within the Secondary Study Area, simulated flows, water temperatures, and useable flooded area were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when splittail are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable for spawning, as a result of decreased flows and reduced useable flooded area occurring more often, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on Sacramento splittail in the Feather River, Sutter Bypass, Yolo Bypass, Delta, and Level 4 wildlife refuges, but **there would be a potentially substantial adverse effect** on Sacramento splittail in the American River.

Striped Bass

Potential impacts associated with implementation of the No Project/No Action Alternative on striped bass were evaluated in the Sacramento River, Feather River, American River, Delta, and bays. Flows, water temperatures, and X2 location were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when striped bass are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows occurring more often, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Striped bass are not considered State or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on striped bass in the Sacramento River, Feather River, Delta, and bays, but **there would be a potentially substantial adverse effect** on striped bass in the American River.

American Shad

Potential impacts associated with implementation of the No Project/No Action Alternative on American shad were evaluated in the Sacramento River, Feather River, American River, Delta, and bays. Flows, water temperatures, and X2 location were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when American shad are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows occurring more often, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

American shad are not considered State or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on American shad in the Sacramento River, Feather River, Delta, and bays, but **there would be a potentially substantial adverse effect** on American shad in the American River.

Largemouth Bass

While largemouth bass are evaluated as a species of recreational importance, they also are evaluated as an indicator of potential impacts on other warmwater game fishes.

Potential impacts associated with implementation of the No Project/No Action Alternative on largemouth bass were evaluated in the Sacramento River, Feather River, American River, Yolo Bypass, and Delta. Flows, water temperatures, X2 location, and monthly Electrical Conductivity (EC) in the Delta were evaluated to identify potential changes in habitat conditions at various locations. Salvage at the SWP and CVP Delta pumping facilities also was evaluated.

In general, during periods when largemouth bass are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to Existing Conditions. However, while flows in the American River would be reduced and water temperatures would be increased, these changes would not be likely to adversely affect largemouth bass or other warmwater game fishes. In fact, the expected reduced flows and more frequently increased water temperatures could potentially benefit largemouth bass by reducing habitat suitability for coldwater fish species, thereby making them more susceptible to predation.

Largemouth bass are not considered State or federal special status species, but are evaluated for their recreational importance. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on largemouth bass in the Sacramento River, Feather River, American River, Yolo Bypass, and Delta.

12.3.5.16 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

No construction, operations, or maintenance activities would occur in the Primary Study Area under the No Project/No Action Alternative. Habitat conditions in Funks and Stone Corral creeks are not anticipated to change with implementation of the No Project/No Action Alternative. However, existing agricultural land use activities in the Primary Study Area are assumed to continue as they do under Existing Conditions. These activities would likely include unrestricted cattle movement within some of the local creeks and continued disturbance to riparian areas. Ongoing land uses and agricultural practices in the Primary Study could result in degraded habitat conditions within Funks and Stone Corral creeks. Therefore, under the No Project/No Action Alternative, relative to Existing Conditions, **there would not be a substantial adverse effect** on fish species and aquatic habitat in Funks and Stone Corral creeks.

12.3.6 Impacts Associated with Alternative A Relative to Existing Conditions

Potential impacts on fish species of primary management concern associated with implementation of Alternative A, relative to Existing Conditions, were evaluated in an identical manner to those described for the No Project/No Action Alternative, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the Export Service Area under Alternative A, relative to Existing Conditions, is presented in Table 12-15. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative A, relative to Existing Conditions, is presented in Table 12-16. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.6.1 Extended and Secondary Study Areas - Alternative A Relative to Existing Conditions

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be similar or more suitable in Trinity, Shasta, Oroville, and Folsom reservoirs under Alternative A, relative to Existing Conditions. Specifically, within the Secondary Study Area, end-of-month storage generally would be greater more often under Alternative A, relative to Existing Conditions, in Trinity, Shasta and Folsom reservoirs, and would be generally similar in Lake Oroville. Reservoir coldwater fish species habitat conditions would be similar or less suitable in San Luis Reservoir, and similar or generally more suitable in export service area reservoirs due to reduced storage more often in San Luis Reservoir, and potentially increased storage in other export service area reservoirs due to increased SWP/CVP exports.

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on reservoir coldwater fish species in Oroville and San Luis reservoirs are considered **less than significant,** and impacts to coldwater fish species in Trinity, Shasta, Folsom, and other export service area reservoirs are considered **potentially beneficial**.

Reservoir Warmwater Fish Species

Reservoir warmwater fish species habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions, in Trinity and Shasta reservoirs because fewer water surface elevation reductions of six feet or more would occur during the warmwater fish nesting season. Therefore, fewer nest dewatering events would be anticipated. Water surface elevation reductions of six feet or more would occur with similar frequency in Oroville Reservoir, and slightly more often in Folsom Reservoir. Therefore, habitat conditions for warmwater fish species are anticipated to be similar in Oroville Reservoir and potentially slightly less suitable in Folsom Reservoir. Habitat conditions in San Luis Reservoir are anticipated to be slightly less suitable because of increased frequencies of water surface elevation reductions of six feet or more, while expected increases in exports more often are anticipated to increase habitat suitability for warmwater fish species inhabiting other export service area reservoirs.

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs are considered **less than significant,** and impacts to warmwater fish species in other export service area reservoirs are considered **potentially beneficial**.

Southern Oregon/Northern California Coho Salmon

Construction activities would not impact Southern Oregon/Northern California Coho salmon because they are not found in the Sacramento River.

In general, habitat conditions in the Trinity River would be similar under Alternative A, relative to Existing Conditions because flows would be similar during most life stages, while water temperature index values would be exceeded with similar frequencies during most life stages (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to Existing Conditions, potential operational impacts on Coho salmon in the Trinity River are considered **less than significant**.

Upper Klamath-Trinity River Fall-Run and Spring-Run Chinook Salmon

Construction activities would not impact Upper Klamath-Trinity River fall-run and spring-run Chinook salmon because they are not found in the Sacramento River.

In general, during the periods when Chinook salmon are present in the Trinity River, habitat conditions, as well as early life stage mortality, would be similar or more suitable under Alternative A, relative to Existing Conditions because flows would be similar, but slightly higher during some life stages while water temperature index values would be exceeded with similar or lower frequencies during all life stages (see Appendix 12C for detailed discussion).

Therefore, under Alternative A, relative to Existing Conditions, potential operational impacts on spring-run and fall-run Chinook salmon in the Trinity River are considered **less than significant**.

Klamath Mountains Province Steelhead

Construction activities would not impact Upper Klamath-Trinity River fall-run and spring-run Chinook salmon because they are not found in the Sacramento River.

In general, during the periods when steelhead are present in the Trinity River, habitat conditions would be similar under Alternative A, relative to Existing Conditions, with flows being lower slightly more often and water temperatures being slightly more suitable more often.

Therefore, under Alternative A, relative to the Existing Condition, potential operational impacts on steelhead in the Trinity River are considered **less than significant**.

Sacramento River Winter-Run Chinook Salmon

Construction in the Secondary Study Area would consist of the installation of additional pump into an existing bay at the Red Bluff Pumping Plant during the annual maintenance period for the T-C Canal. Although the canal would be dry during construction, construction activities would occur near the Sacramento River and therefore could potentially impact winter-run Chinook salmon in the Sacramento River as they migrate upstream (adults) or downstream (emigrating juveniles). Potential impact mechanisms include: (1) increases in sedimentation and turbidity; and (2) hazardous materials and chemical spills. These potential impacts could result in reduced habitat suitability, physiological stress and sub-lethal effects, as well as direct mortality to individual fish, which could result in population-level impacts (e.g., reduced spawning activity and subsequent initial year class strength).

Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on winter-run Chinook salmon in the Sacramento River are considered **potentially significant**.

In general, during periods when winter-run Chinook salmon are present in the Sutter Bypass, Delta, and bays downstream of the Delta, habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions. Habitat conditions in the Sacramento River would be generally more suitable as a result of more suitable spawning and embryo incubation conditions more often, while habitat conditions in the Delta would be similar or more suitable due to generally higher juvenile survival through the Delta (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on winter-run Chinook salmon in the Sutter Bypass, Delta, and the bays are considered **less than significant,** and operational impacts on winter-run Chinook salmon in the Sacramento River are considered **potentially beneficial**.

Central Valley Spring-Run Chinook Salmon

Construction-related impacts on spring-run Chinook salmon would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on spring-run Chinook salmon in the Sacramento River are considered **potentially significant**.

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions, due to more frequently increased flows and reduced water temperatures. Habitat conditions in the American River for non-natal juvenile spring-run Chinook salmon would be generally similar or slightly less suitable due to reduced flows occurring more frequently under Alternative A, relative to Existing Conditions. However, it is not anticipated that these habitat conditions would substantially affect spring-run Chinook salmon, particularly because the American River only supports non-natal juvenile rearing (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational- impacts on spring-run Chinook salmon in Clear Creek, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant,** and impacts on spring-run Chinook salmon in the Sacramento River are considered **potentially beneficial**.

Central Valley Fall-Run Chinook Salmon

Construction-related impacts on fall-run Chinook salmon would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on fall-run Chinook salmon in the Sacramento River are considered **potentially significant**.

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable during all life stages (see Appendix 12C for a detailed discussion). Specifically, decreased flows and increased water temperatures, as well as increased early life stage mortality would occur more frequently, as a result of implementation of Alternative A.

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on fall-run Chinook salmon in the Sacramento River, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant.**

On the American River under Alternative A relative to Existing Conditions, impacts on fall-run Chinook salmon would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on fall-run Chinook salmon are considered to be **less than significant**.

Central Valley Late Fall-Run Chinook Salmon

Construction-related impacts on late fall-run Chinook salmon would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on late fall-run Chinook salmon in the Sacramento River are considered **potentially significant**.

In general, during periods when late fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to the Existing Condition (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on late fall-run Chinook salmon in the Sacramento River, Clear Creek, Sutter Bypass, Delta, and bays are considered **less than significant**.

Central Valley Steelhead

Construction-related impacts on steelhead would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on steelhead in the Sacramento River are considered **potentially significant**.

In general, during periods when steelhead are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions. However, habitat conditions in Clear Creek would be similar during most years, but would be generally more suitable for all life stages during low flow conditions as a result of increased flows and decreased water temperatures occurring more frequently. Habitat conditions in the American River would be substantially less suitable for adult immigration and holding, juvenile rearing and emigration, and smolt emigration, as a result of decreased flows and increased water temperatures occurring more frequently, particularly during low flow conditions when habitat may be limited. Habitat conditions in the Yolo Bypass would also be less suitable for juvenile rearing and emigration, as a result of decreased frequency of inundation (as identified by reduced Yolo Bypass outflow more often), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on steelhead in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant,** and impacts on steelhead in the Yolo Bypass are considered **potentially significant**.

On the American River under Alternative A relative to Existing Conditions, impacts on steelhead would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on steelhead are considered to be **less than significant**.

Green Sturgeon

Construction-related impacts on green sturgeon would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on green sturgeon in the Sacramento River are considered **potentially significant**.

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions. However, habitat conditions in the American River would be substantially less suitable during all green sturgeon life stages due to decreased flows more often and increased water temperatures occurring with similar or higher frequencies, particularly during low flow conditions. Habitat conditions in the Yolo Bypass would also be less suitable for juvenile rearing and emigration as a result of decreased frequency of inundation (as identified by reduced Yolo Bypass outflow more often), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on green sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on green sturgeon in the Yolo Bypass are considered **potentially significant**.

On the American River under Alternative A relative to Existing Conditions, impacts on green sturgeon would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on green sturgeon are considered to be **less than significant**.

White Sturgeon

Construction-related impacts on white sturgeon would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on white sturgeon in the Sacramento River are considered **potentially significant**.

In general, during periods when white sturgeon are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions in the Trinity River, Sutter Bypass, Delta and Bays, but would be similar or less suitable in the Sacramento and Feather rivers. Habitat conditions would be less suitable in the Sacramento River due to reduced flows more often during the spawning and embryo incubation lifestage, but water temperatures would not be increased substantially more often. Habitat conditions would be less suitable in the Feather River due to reduced flows more often during all lifestage periodicities, but water temperatures would be generally similar. Additionally, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing due to a decreased frequency of floodplain activation, which results in reduced floodplain rearing opportunities and reduced nutrient inflow to the Delta and bays (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on white sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant,** and impacts to white sturgeon in the Yolo Bypass are considered **potentially significant**.

Pacific Lamprey

Construction-related impacts on Pacific lamprey would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on Pacific lamprey in the Sacramento River are considered **potentially significant**.

In general, during periods when Pacific lamprey are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions in the Trinity and Sacramento rivers, the Delta and bays, would be similar or more suitable in Clear Creek, would be similar or less suitable in the Feather River, and would be substantially less suitable in the American River. Habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions as a result of increased flows occurring more often. Habitat conditions in the Feather would be slightly less suitable due to generally reduced flows slightly more often for all life stages. Habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows and similar or increased probabilities of higher water temperatures, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on Pacific lamprey in the Trinity River, Sacramento River, Clear Creek, Feather River, Delta, and bays are considered **less than significant**. On the American River under Alternative A relative to Existing Conditions, impacts on Pacific lamprey would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on Pacific lamprey are considered to be **less than significant**.

River Lamprey

Construction-related impacts on river lamprey would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on river lamprey in the Sacramento River are considered **potentially significant**.

In general, during periods when river lamprey are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions in the Sacramento River, the Delta and bays, would be similar or more suitable in Clear Creek, would be similar or less suitable in the Feather River, and would be substantially less suitable in the American River. Simulated habitat conditions in Clear Creek would be similar during most years, but would be more suitable for all life stages during low flow conditions as a result of increased flows occurring more often. Habitat conditions in the Feather River would be slightly less suitable due to generally reduced flows occurring slightly more often for all life stages. Habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows and similar or increased probabilities of higher water temperatures, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to Existing Conditions, potential operational impacts on river lamprey in the Sacramento River, Clear Creek, Feather River, Delta, and bays are considered **less than significant**. On the American River under Alternative A relative to Existing Conditions, impacts on river lamprey would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on river lamprey are considered to be **less than significant**.

Hardhead

Construction-related impacts on hardhead would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on river lamprey in the Sacramento River are considered **potentially significant**.

In general, during periods when hardhead are present in the Sacramento and American rivers, habitat conditions would be similar under Alternative A, relative to Existing Conditions. Habitat conditions in Clear Creek would be similar during most years, but are more suitable for all life stages during low flow conditions due to increased flows occurring more often. Additionally, habitat conditions in the Feather River would be generally less suitable for all life stages due to decreased flows occurring more frequently (see Appendix 12C for a detailed discussion). However, because reduced habitat suitability would be a result of decreased flows occurring more frequently while water temperatures generally remain within the range considered suitable, reduced flows alone would not be anticipated to result in a substantial impact on hardhead.

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on hardhead in the Sacramento River, Clear Creek, Feather River, and American River are considered **less than significant**.

California Roach

Construction-related impacts on roach in the Sacramento River would be identical to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on roach in the Sacramento River are considered **potentially significant**.

Within the Secondary Study Area, during periods when roach are present in the Sacramento, Feather and American rivers, habitat conditions generally would be similar under Alternative A, relative to Existing Conditions. Habitat conditions in Clear Creek would be similar during most years, but would be more suitable for spawning during low flow conditions as a result of increased flows occurring more often. Habitat conditions for roach within the wildlife refuges of the Extended Study Area are anticipated to be similar under Alternative A, relative to Existing Conditions.

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on California roach in the Sacramento River, Clear Creek, Feather River, American River, and Level 4 wildlife refuges are considered **less than significant**.

Delta Smelt

Construction activities would not impact delta smelt because they are not found in the Sacramento River near the construction location.

In general, during periods when delta smelt are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions.

Therefore, under Alternative A, relative to Existing Conditions, impacts on delta smelt in the Delta and bays are considered **less than significant**.

Longfin Smelt

Construction activities would not impact longfin smelt because they are not found in the Sacramento River near the construction location.

In general, during periods when longfin smelt are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions.

Therefore, under Alternative A, relative to Existing Conditions, impacts on longfin smelt in the Delta and bays are considered **less than significant**.

Sacramento Splittail

Construction-related impacts on splittail would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on splittail in the Sacramento River are considered **potentially significant**.

In general, during periods when splittail are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions in the Feather River and the Sutter Bypass. Habitat conditions in the American River would be slightly less suitable for spawning due to decreased flows and reduced useable flooded area occurring slightly more often. The reduction in usable flooded area slightly more often is not anticipated to result in a substantial impact to splittail in the American River. Habitat conditions for splittail within the wildlife refuges of the Extended Study Area are anticipated to be similar under Alternative A, relative to Existing Conditions. Additionally, reduced flows into and out of the Yolo Bypass would result in less suitable habitat conditions for splittail spawning. Because of the importance of the Yolo Bypass to splittail population abundance, reduced floodplain inundation in the Yolo Bypass constitutes a substantial impact (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to Existing Conditions, potential operational impacts on splittail in the Feather River, American River, Sutter Bypass, Delta, and Level 4 wildlife refuges are considered **less than significant**, and impacts on splittail in the Yolo Bypass are considered **potentially significant**.

Striped Bass

Construction-related impacts on striped bass would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on striped bass in the Sacramento River are considered **potentially significant**.

In general, during periods when striped bass are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions. However, habitat conditions in the Feather River would be similar or less suitable due to lower flows more often during the spawning and early life stage period. Habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows occurring more often, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to Existing Conditions, potential operational impacts on striped bass in the Sacramento River, Feather River, Delta, and bays are considered **less than significant**. On the American River under Alternative A relative to Existing Conditions, impacts on striped bass would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on striped bass are considered to be **less than significant**.

American Shad

Construction-related impacts on American shad would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on American shad in the Sacramento River are considered **potentially significant**.

In general, during periods when striped bass are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions. However, habitat conditions in the Feather River would be similar or less suitable due to lower flows more often during the spawning and early life stage period. Habitat conditions in the American River would be substantially less suitable for all life stages, as a result of decreased flows occurring more often, particularly during low flow conditions when habitat may be limited (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on American shad in the Sacramento River, Feather River, Delta, and bays are considered **less than significant**. On the American River under Alternative A relative to Existing Conditions, impacts on American shad would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative A, the potential operational impacts on American shad are considered to be **less than significant**.

Largemouth Bass

While largemouth bass are evaluated as a species of recreational importance, they also are evaluated as an indicator of potential impacts on other warmwater game fishes.

Construction-related impacts on largemouth bass would be similar to those described for winter-run Chinook salmon. Therefore potential construction-related impacts associated with implementation of Alternative A, relative to Existing Conditions, on largemouth bass in the Sacramento River are considered **potentially significant**.

In general, during periods when largemouth bass are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to Existing Conditions. Habitat conditions in the Delta and Yolo Bypass would be similar or less suitable due to reduced flows into and out of the Yolo Bypass, resulting in reduced habitat availability for all life stages. However, reduced flows in the Yolo Bypass are not likely to adversely impact largemouth bass or other warmwater game fishes. In fact, reduced flows and increased water temperatures occurring more frequently could potentially benefit largemouth bass by reducing habitat suitability for coldwater fish species, thereby making them more susceptible to predation. Additionally, habitat availability in the Delta would be increased during the summer and fall due to reduced EC at various locations.

Therefore, for Alternative A, relative to Existing Conditions, potential impacts on largemouth bass in the Sacramento River, Feather River, American River, and Delta are considered **less than significant,** and impacts to largemouth bass in the Yolo Bypass are considered **potentially significant**.

Ecosystem Enhancement Storage Account – Operational Actions (Project-level Analysis – Alternatives A, B and C)

NODOS Project planners adopted a list of objectives that were incorporated into the operations strategy for the action alternative plans. The objectives, which are referred to as the Ecosystem Enhancement Storage Account (EESA), and their associated potential effects on fish species of primary management concern and aquatic habitat are described below:

- **Improve the reliability of coldwater pool storage in Shasta Lake to increase Reclamation's operational flexibility to provide suitable water temperatures for fish species in the Sacramento River.** This action would operationally translate into an increase in Shasta Lake May storage levels, and increased coldwater pool storage, with particular emphasis on Below Normal, Dry, and Critical water year types. Refer to species-specific SWP and CVP operations analyses for the Sacramento River for potential effects of this action on fish species of primary management concern.
- **Provide releases of appropriate water temperatures from Shasta Dam, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and life stages of anadromous salmonids in the Sacramento River between Keswick Dam and Red Bluff Diversion Dam.** Particular emphasis should be placed on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types. Refer to species-specific SWP and CVP operations analyses for the Sacramento River for potential effects of this action on fish species of primary management concern.
- **Increase the availability of coldwater pool storage in Folsom Reservoir, by increasing May storage, to allow Reclamation additional operational flexibility to provide suitable water temperatures in the American River.** This action would utilize additional coldwater pool storage by

providing releases from Folsom Dam (and subsequently from Nimbus Dam) to maintain mean daily water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the American River from May through November during all water year types. This action may potentially increase the suitability of water temperature conditions in the American River for fish species of primary management concern during May through November of all water year types.

- **Stabilize flows in the American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce isolation events (specifically, flow increases to ≥ 4,000-cfs with subsequent reduction to < 4,000 cfs) of juvenile anadromous salmonids, particularly from October through June. Reduce the reliance upon Folsom Reservoir as a "real-time, first response facility" to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the American River.** This action may potentially reduce fall-run Chinook salmon and steelhead redd dewatering and redd isolation events, and potentially improve water temperature conditions for fall-run Chinook salmon and steelhead in the American River.

- **Provide supplemental Delta outflow during summer and fall months (i.e., May through December) to improve X2 location (if possible, west of Collinsville, 81 km) and increase estuarine habitat, reduce entrainment, and improve food availability for anadromous fishes and other estuarine-dependent species (e.g., delta smelt, longfin smelt).** Refer to species-specific SWP and CVP operations analyses for the Delta for potential effects of this action on fish species of primary management concern. General changes in mean monthly Delta outflow under each modeled Alternative comparison are described below:

  - Alternative A relative to Existing Conditions: Delta outflow would be increased more often during October, December, and June through September, but would be reduced more often during November and January through May.
  - Alternative A relative to the No Project/No Action Alternative: Delta outflow would be increased more often during October, December, and June through September, and would be reduced more often during November and January through April.
  - Alternative B relative to Existing Conditions: Delta outflow would be increased more often during October, December, and June through September, and would be reduced more often during November and January through May.
  - Alternative B relative to the No Project/No Action Alternative: Delta outflow would be increased more often during October, December, and June through September, and would be reduced more often during November and January through May.
  - Alternative C relative to Existing Conditions: Delta outflow would be increased more often during October through December and June through September, and would be reduced more often during January through May.
  - Alternative C relative to the No Project/No Action Alternative: Delta outflow would be increased more often during October, December and June through September, and would be reduced more often during November and January through May

- **Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain mean daily water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run Chinook salmon spawning in the Feather River. Stabilize flows in the Feather River to minimize redd dewatering, juvenile anadromous salmonid stranding, and isolation.** Refer to species-specific SWP and CVP operations analyses for the Feather River for potential effects of this action on fish species of primary management concern. In addition, this action may improve the suitability of daily water temperatures for fish species of primary management concern during May through November, and potentially reduce anadromous salmonid redd dewatering and juvenile stranding and isolation in the Feather River.
- **Stabilize flows in the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation life stage periods extending from October through March), particularly during fall months.** Refer to species-specific SWP and CVP operations analyses for the Sacramento River for potential effects of this action on fish species of primary management concern.
- **Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at Red Bluff Diversion Dam (into the Tehama-Colusa Canal) and at Hamilton City (into the Glenn-Colusa Irrigation District Canal), and by providing supplemental flows (at Delevan).** This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, and Sacramento splittail) by providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability. Refer to species-specific SWP and CVP operations analyses for the Sacramento River and the Delta for potential effects of this action on fish species of primary management concern. To address other aquatic biological resources potentially affected by changes in flows into and through the Delta, changes in modeled Delta outflow were evaluated for each alternative comparison below.

Ecosystem Enhancement Fund – Non-Operational Actions (Programmatic-level Analysis – Alternatives A, B and C)

The Ecosystem Enhancement Fund (EEF) would be established as an endowment to provide long-term funding for aquatic habitat restoration actions on the Sacramento River and its tributaries that do not necessarily require additional water. Projects implemented through the EEF would be in addition to any NODOS Project mitigation, CVPIA, or OCAP requirements.

A Governance Board would manage the fund, prioritize potential projects, and collaboratively determine funded actions, based upon habitat needs. The fund would support planning and implementation of priority non-operational actions. Projects eligible for EEF funding would include those that would directly benefit anadromous fish, with an emphasis on actions in the Sacramento River (e.g. spawning gravel augmentation; sidechannel, riparian, or floodplain restoration; and construction of instream aquatic habitat downstream from Keswick Dam).

These types of restoration projects would potentially result in beneficial effects to fish species of primary management concern, particularly anadromous salmonids and sturgeon. Project-specific environmental documentation would be completed prior to implementation of actions associated with the Ecosystem Enhancement Fund to identify any potential impacts or benefits to fish species of primary management concern.

12.3.6.2 Primary Study Area - Alternative A Relative to Existing Conditions

Construction, Operation, and Maintenance Impacts

The potential impacts of proposed Project facilities that would be located within or adjacent to waterways are described below.

Sites Reservoir Inundation Area and Sites Dams

Erosion, Sedimentation and Turbidity

Construction activities associated with the Sites Reservoir Inundation Area and Sites Dams, including clearing and grubbing vegetation, would have the potential to cause erosion and contribute sediment to Funks and Stone Corral creeks downstream of the construction activities. During Project operation and maintenance, stream maintenance flows discharged from Sites Reservoir into Funks and Stone Corral creeks, as well as debris and vegetation removal associated with maintenance of the dam embankments, could also result in increased erosion and turbidity. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes from suspended sediments (Birtwell et al., 1984; DeVore et al., 1980; Scannell, 1988). Exposure duration is reportedly a critical determinant of the occurrence and magnitude of potential physical or behavioral effects on fishes associated with increased turbidity (Newcombe and MacDonald, 1991). While native fish species such as salmonids reportedly appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser, 1991), chronic exposure to increased turbidity can cause physiological stress responses that can increase maintenance energy use and reduce feeding and growth (Lloyd, 1987; Redding et al., 1987; Servizi and Martens, 1991). Because increased turbidity and sedimentation could cause temporary changes in fish behavior, the potential for predation also may be increased. Increased erosion, turbidity, and predation resulting from construction, operation, and maintenance of Sites Reservoir and Dams could result in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter Funks and Stone Corral creeks as a result of seepage or accidental spills. During maintenance activities, there is also the potential for chemical or hazardous spills or leakage in these creeks. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas. Hazardous materials and chemical spills associated with the construction and maintenance of Sites Reservoir and Dams could result in a **potentially significant impact** to fish species of primary management concern.

Hydrostatic Pressure Waves, Noise, and Vibration

Construction of Golden Gate and Sites dams on Funks and Stone Corral creeks, respectively, could potentially result in noise-related impacts to fish species in Funks and Stone Corral creeks, resulting in a potentially significant impact to fish species of primary management concern.

However, because Funks and Stone Corral creeks would be temporarily re-routed around the construction areas, potential impacts to fisheries resources would be minimized (see Section 12.4) and are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities also have some limited potential to "harm" juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operation, and maintenance activities would be located on land, the potential for direct physical harm would be minimal. Therefore, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Water Surface Elevation Fluctuations

Water surface elevation fluctuations may occur within Sites Reservoir once it is constructed and filled, potentially impacting any stocked fisheries that may occur within Sites Reservoir after it becomes operational. However, because no fishery exists in Sites Reservoir under Existing Conditions or the No Project/No Action Alternative, there are **no potential impacts** to aquatic biological resources in Sites Reservoir to evaluate.

Aquatic Habitat Modification

Construction of Sites Reservoir (1.27 MAF under Alternative A) would eliminate and inundate approximately 3.9 miles of Stone Corral Creek and approximately 6.5 miles of Funks Creek upstream of Sites and Golden Gate dams. Stone Corral and Funks creeks are characterized by deeply incised channels with little riparian vegetation or instream cover (Brown, 2000). In addition, water quality is reported to be poor and high in dissolved minerals (Brown, 2000). While the reaches of Funks Creek and Stone Corral Creek that would be inundated generally have little riparian habitat and are ephemeral (Figure 12-7), they have been found to support native and non-native fish species, including California roach, Sacramento blackfish, and Sacramento sucker (Brown, 2000). The reach of Funks Creek immediately downstream of the proposed Sites Dam appears to have more suitable aquatic and riparian habitat compared to other reaches of the creek (Figures 12-8 and 12-9). Adult, juvenile, and early life stages of fish species of primary management concern could be present within and downstream of construction, operation, and maintenance areas year-round. Aquatic habitat removal and modification, specifically the inundation of Funks and Stone Corral creeks associated with the construction of Sites Reservoir, would result in a **potentially significant impact** to fish species of primary management concern.

Operation and maintenance activities in the vicinity of Sites and Golden Gate dams are not anticipated to substantially modify aquatic habitat in Stone Corral or Funks creeks downstream of Sites Reservoir, and would be conducted such that any restored habitat would not be degraded, resulting in a **less than significant impact** to fish species of primary management concern.

Road Relocations and South Bridge

Erosion, Sedimentation and Turbidity

Construction activities associated with road relocations and construction of the South Bridge in the vicinity of Funks and Stone Corral creeks would have the potential to cause erosion and contribute sediment to the creeks downstream of the construction activities, particularly at the proposed Eastside

Road crossing at Funks Creek. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes from suspended sediments (Birtwell et al., 1984; DeVore et al., 1980; Scannell, 1988). Because increased turbidity and sedimentation could cause temporary changes in fish behavior, the potential for predation also may be increased and could result in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter Funks and Stone Corral creeks as a result of seepage or accidental spills. During road and bridge maintenance activities, there is also the potential for chemical or hazardous spills or leakage in these creeks. Accidental discharge of hazardous materials and chemicals could affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas, and could therefore result in a **potentially significant impact** to fish species of primary management concern.

Hydrostatic Pressure Waves, Noise, and Vibration

Construction of the Eastside Road Bridge over Funks Creek may include pile driving activities, potentially resulting in noise-related impacts to fisheries in Funks Creek, which could adversely affect fish species of primary management concern.

However, Funks Creeks would be re-routed away from the construction areas, minimizing any potential impacts to fisheries resources (see Section 12.4) and resulting in a **less than significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have limited potential to “harm” juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operations, and maintenance activities would be located on land, the potential for direct physical harm would be minimal. Therefore, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Aquatic Habitat Modification

Construction activities associated with road relocations and bridges in the vicinity of Funks and Stone Corral creeks would have the potential to alter aquatic habitat conditions. Stone Corral and Funks creeks are characterized by deeply incised channels with little riparian vegetation or instream cover (Brown, 2000). The reaches of Funks Creek and Stone Corral Creek that may be affected generally have little riparian and aquatic habitat. It is not anticipated that riparian or aquatic habitat would be permanently removed or substantially impacted by road relocations or bridge construction. Operation and maintenance activities associated with new roads and bridges also are not anticipated to substantially modify aquatic habitat in the downstream reaches of Stone Corral or Funks creeks. Therefore, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Fish Passage

It is expected that activities associated with road relocation and bridge construction in the vicinity of Stone Corral and Funks creeks would occur when the creeks are ponded or dry, or when the creeks are re-routed away from the construction area. Therefore, construction of the Eastside Road Bridge over Funks Creek is not anticipated to substantially affect hydrologic or fish passage conditions within Funks Creek. Construction of any culverts on Funks and Stone Corral creeks would be designed to maintain existing fish passage conditions. Operation and maintenance activities associated with constructed roads and bridges would be conducted in a manner that would not substantially affect fish passage conditions. Therefore, these activities are anticipated to result in a **less than significant** impact to fish species of primary management concern.

Sites Reservoir Inlet/Outlet Structure and Sites Pumping/Generating Plant

Erosion, Sedimentation and Turbidity

Construction activities associated with the Sites Reservoir Inlet/Outlet Structure and the Sites Pumping/Generating Plant along Funks Creek would have the potential to cause erosion and contribute sediment to Funks Creek downstream of the construction activities. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes from suspended sediments (Birtwell et al., 1984; DeVore et al., 1980; Scannell, 1988). Because increased turbidity and sedimentation could cause temporary changes in fish behavior, the potential for predation also may be increased and could result in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter Funks Creek as a result of seepage or accidental spills. During construction activities there would also be the potential for chemical or hazardous spills or leakage into Funks Creek. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas and, therefore, could result in a **potentially significant impact** to fish species of primary management concern.

Hydrostatic Pressure Waves, Noise, and Vibration

Construction of the Sites Reservoir Inlet/Outlet Structure and Sites Pumping/Generating Plant may include construction activities that result in noise and vibration effects to fisheries resources in Funks Creek, potentially impacting fish species in Funks Creek.

However, Funks Creek would be re-routed away from the construction areas to minimize any potential impacts to fisheries resources. Construction activities are therefore anticipated to result in a **less than significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have limited potential to “harm” juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operation, and maintenance activities would be located on land, the potential for direct physical harm would be minimal. Therefore, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Aquatic Habitat Modification

Construction of the Sites Reservoir Outlet Structure would permanently remove approximately 0.5 mile of Funks Creek immediately upstream of the existing Funks Reservoir. As previously discussed, Funks Creek is characterized by deeply incised channels with little riparian vegetation or instream cover (Brown, 2000). While the reach of Funks Creek that would be removed generally has little riparian habitat and is ephemeral, it has been found to support native and non-native fish species, including California roach, Sacramento blackfish and Sacramento sucker (Brown, 2000). The reach of Funks Creek immediately downstream of the proposed Holthouse Dam appears to have more suitable aquatic and riparian habitat compared to other reaches of the creek (Figures 12-8 and 12-9). Adult, juvenile, and early life stages of fish species of primary management concern could be present within and downstream of construction, operation, and maintenance areas year-round. Aquatic habitat removal and modification associated with the construction of the Sites Reservoir Inlet/Outlet Structure and Sites Pumping/Generating Plant would result in a **potentially significant impact** to fish species of primary management concern.

Fish Passage

As previously discussed, construction of the inlet/outlet structure would eliminate approximately 0.5 mile of Funks Creek immediately upstream of the existing Funks Reservoir. During construction activities, Funks Creek would be diverted upstream of the inlet/outlet structure construction area, preventing fish passage through the construction area. The extent to which fish species may currently move between Funks Reservoir and Funks Creek upstream of Funks Reservoir is unknown. However, Funks Creek would connect to the approach channel of the inlet/outlet structure to allow flows and fish passage between Funks Creek, the inlet/outlet structure, and Holthouse Reservoir. Operation and maintenance activities associated with the inlet/outlet structure would be conducted as to not substantially affect fish passage conditions. These activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Holthouse Reservoir Complex

The Holthouse Reservoir Complex includes the Holthouse Reservoir and Dam, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, the T-C Canal Bypass Pipeline, and the Holthouse to T-C Canal Pipeline.

Erosion, Sedimentation and Turbidity

Construction of the Holthouse Reservoir Complex would occur adjacent to the existing Funks Reservoir, and thus would have the potential to increase erosion, sedimentation and turbidity in Funks Creek downstream of the construction area. Dredging activities at Funks Reservoir associated with removal of accumulated sediment would also have the potential to increase sedimentation and turbidity in Funks Creek downstream of Funks Reservoir, which could result in a **potentially significant impact** to fish species of primary management concern.

Maintenance activities at the Holthouse Reservoir Complex, such as periodic road, vegetation, and fence maintenance, as well as debris removal, would also have the potential to increase erosion and turbidity in Funks Creek downstream of the proposed Holthouse Reservoir. However, maintenance activities at Holthouse Reservoir are anticipated to be similar to existing maintenance activities at Funks Reservoir, and would be conducted to avoid impacting any aquatic habitat that may have been restored. Flows released into Funks Creek from Holthouse Reservoir are anticipated to be consistent with flow conditions under Existing Conditions, but have the potential for increasing sedimentation and turbidity in Funks Creek, resulting in a potentially significant impact to fish species of primary management concern. However, construction of a velocity dissipater on the inlet/outlet structure is anticipated to minimize sedimentation and turbidity and result in a **less than significant impact** to fish species of primary management concern (see Section 12.4).

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter Funks Creek as a result of seepage or accidental spills. During operation and maintenance activities, such as debris and sediment removal, dredging, equipment maintenance, and repairs, there would also be the potential for chemical or hazardous spills or leakage in the creek. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas, and could result in a **potentially significant impact** to fish species of primary management concern.

Hydrostatic Pressure Waves, Noise, and Vibration

Construction of the Holthouse Reservoir Complex may involve construction activities that could result in increased noise and vibration levels in local waterways, resulting in a potentially significant impact to fish species of primary management concern.

However, Funks Creek would be re-routed away from the construction area to minimize any potential impacts to fisheries resources and is anticipated to result in a **less than significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have limited potential to directly “harm” juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because Funks Creek would be re-routed away from the construction area, the potential for direct physical harm would be minimal. Therefore, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Aquatic Habitat Modification

The construction of the dam and spillway stilling basin, and the consequent inundation of Holthouse Reservoir, would result in the permanent removal of the reach of Funks Creek immediately downstream of the existing Funks Reservoir (approximately 0.7 stream mile) (Figures 12-8 and 12-9). Adult, juvenile, and early life stages of fish species of primary management concern could be present within and downstream of construction, operation, and maintenance areas year-round. Aquatic habitat removal and modification within Funks Creek associated with the construction and inundation of Holthouse Reservoir would result in a **potentially significant impact** to fish species of primary management concern.

Operation and maintenance activities at Funks and Holthouse reservoirs, such as periodic road, vegetation, and fence maintenance, would not be anticipated to substantially affect aquatic habitat in Funks Creek, and would be conducted such that restored areas are not degraded. Operation and maintenance activities are therefore anticipated to result in a **less than significant impact** to fish species of primary management concern.

Fish Passage

Funks Creek would be diverted during construction activities, and Funks Reservoir would be drained during dredging activities. In-stream construction activities also could impede upstream passage of resident fishes due to altered hydrologic conditions. However, because fish passage is generally blocked at the outlet of the existing Funks Reservoir and the reservoir is drained annually under Existing Conditions, these activities are anticipated to result in a **less than significant impact** to fish species of primary management concern.

Following completion of construction of the Holthouse Reservoir Complex, it is anticipated that fish passage would be blocked downstream of Holthouse Reservoir. However, Flow releases from Holthouse Reservoir into Funks Creek are anticipated to be generally consistent with flow conditions in Funks Creek under Existing Conditions, resulting in a **less than significant impact** to fish species of primary management concern.

GCID Canal Facilities Modifications

Erosion, Sedimentation and Turbidity

Construction activities at the GCID Canal intake and headworks facilities, which involve installing a new headgate structure, lining 200 feet of the canal, and replacing a railroad siphon, have the potential to increase erosion, sedimentation, and turbidity within the GCID Canal and in the Sacramento River in the vicinity of the GCID Canal intake structure. Ongoing maintenance activities, such as sediment removal may also temporarily increase turbidity within the GCID Canal and in the Sacramento River in the vicinity of the GCID Canal intake structure. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes from suspended sediments (Birtwell et al., 1984; DeVore et al., 1980; Scannell, 1988). Because increased turbidity and sedimentation could cause temporary changes in fish behavior, the potential for predation also may be increased. This could result in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter the GCID Canal or the Sacramento River as a result of accidental spills. During operation and maintenance activities, such as debris and sediment removal, and equipment maintenance and repairs, there would also be the potential for chemical or hazardous spills or leakage into the canal and river. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas. This could result in a **potentially significant impact** to fish species of primary management concern.

TRR to Funks Creek Pipeline

Erosion, Sedimentation and Turbidity

Construction of the TRR to Funks Creek Pipeline has the potential to increase erosion, sedimentation, and turbidity within Funks Creek in the vicinity of the proposed pipeline and could therefore result in a **potentially significant impact** to fish species of primary management concern. Discharge operations of water from the TRR to Funks Creek also have the potential to increase turbidity in Funks Creek. However, a velocity dissipater at the outlet of the pipeline is anticipated to minimize potential increases in turbidity in Funks Creek (see Section 12.4), resulting in a **less-than-significant impact** to fish species of primary management concern.

Ongoing maintenance activities, such as sediment removal, could also temporarily increase turbidity within Funks Creek, resulting in a **potentially significant impact**.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter Funks Creek as a result of accidental spills. During operation and maintenance activities, such as debris and sediment removal, and equipment maintenance and repairs, there would also be the potential for chemical or hazardous spills or leakage into the canal and river. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas, and could result in a **potentially significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have limited potential to directly “harm” juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operation, and maintenance activities would be located on land, the potential for direct physical harm would be minimal. Therefore, these activities are anticipated to result in a **less-than-significant impact** to fish species of primary management concern.

Delevan Pipeline

Erosion, Sedimentation and Turbidity

The Delevan Pipeline would be constructed to convey water from the Sacramento River to Holthouse Reservoir, and also to convey water from Holthouse Reservoir to the Sacramento River. The pipeline would cross the Colusa Basin Drain and Hunters Creek, a tributary to the Colusa Basin Drain. Construction activities at the creek crossings would have the potential to increase erosion, sedimentation, and turbidity within the Colusa Basin Drain and Hunters Creek. However, construction of the Colusa Basin Drain crossing would likely occur during late fall, after the irrigation season ends and before winter rains begin. Portions of the CBD would likely be dewatered so that the pipeline trench could be excavated and the pipeline could be installed. Trench dewatering would involve discharging water into local irrigation ditches and drainage canals after silt is allowed to settle out. Construction would be staged at this crossing and would occur within one half of the channel while an installed coffer dam bypasses flows on the other half of the channel. After installation, the CBD would be returned to service and would be reconstructed to pre-Project conditions. Construction of the Hunters Creek crossing would likely occur when the creek is dry. Construction and dewatering activities would have the potential to increase turbidity levels in adjacent waterways, potentially affecting fisheries resources that may be present and resulting in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter the Colusa Basin Drain or Hunters Creek as a result of accidental spills. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction and maintenance areas and could result in a **potentially significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have limited potential to "harm" juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operation, and maintenance activities would be located on land, the potential for direct physical harm would be minimal and is anticipated to result in **a less-than-significant impact** to fish species of management concern.

Aquatic Habitat Modifications

Construction activities required to install the Delevan Pipeline underneath the Colusa Basin Drain and Hunters Creek may require disturbance of aquatic habitat and removal of riparian vegetation, which could result in a **potentially significant impact** to fish species of primary management concern.

Fish Passage

It is not anticipated that the fish species potentially present in the Colusa Basin Drain or Hunters Creek (e.g., centrarchids, Sacramento sucker, Sacramento blackfish, hitch, and California roach) would be substantially affected by a partial and temporary blockage of these waterways. While a few anadromous salmonids are frequently observed in the Colusa Basin Drain during some years, they are not believed to represent a sustainable population and are likely strays from the Sacramento River. Therefore, partial and temporary blockage of the Colusa Basin Drain and Hunters Creek is anticipated to result in a **less-than-significant impact** to fish species of primary management concern.

Delevan Pipeline Intake Facilities

Erosion, Sedimentation and Turbidity

The proposed Delevan Pipeline Intake Facilities on the Sacramento River would include a system of structures to divert water from the Sacramento River, release water to the Sacramento River, and generate electricity when water is released to the Sacramento River. A fish screen structure also would be constructed at the point of diversion. In-river construction would be accommodated by constructing a cofferdam along the entire length of the intake structure (approximately 1,200 feet) and dewatering the area within the cofferdam.

Construction activities associated with construction of the intake facilities, including clearing and grading, transportation of materials, construction of the cofferdam, dewatering the cofferdam, excavation of the forebay and pumping plant site, construction of a berm/ring levee, construction of the facility structures and fish screen system, removal of the cofferdam, fill and re-grading activities, and restoration of disturbed areas after construction all have the potential to increase erosion, sedimentation and turbidity near and downstream of the construction site in the Sacramento River. This increased erosion, sedimentation, and turbidity could result in a **potentially significant impact** to fish species of primary management concern.

Operation of the intake facilities also has the potential to increase turbidity in the Sacramento River in the vicinity of the intake structure; however, the fish screen would act as a velocity dissipater when water is being released to the Sacramento River, minimizing potential increases in turbidity and resulting in **less-than-significant** impacts.

Maintenance activities, including periodic sediment removal within the forebay and dredging of the intake channel every few years, may result in increased turbidity within the Sacramento River, which would have a **potentially significant impact** on fish species of primary management concern. As discussed for the Secondary Study Area, increases in turbidity in the Sacramento River may temporarily disrupt normal behaviors of fish species that are essential to growth and survival such as feeding, sheltering, and migrating, resulting in a **potentially significant impact** to fish species of primary management concern.

Hazardous Materials and Chemical Spills

Hazardous materials and chemicals in the form of gasoline, engine oil, lubricants, or other fluids used during construction activities could potentially enter the Sacramento River as a result of seepage or accidental spills. During operations and maintenance activities, such as debris and sediment removal, dredging, equipment maintenance, and repairs, there would also be the potential for chemical or hazardous spills or leakage into the Sacramento River. Accidental discharge of hazardous materials and chemicals could potentially affect fishes that may be present in the immediate vicinity and downstream of the construction, operation, and maintenance areas by increasing physiological stress and altering their behavior, which could result in an increased susceptibility to predation. Accidental spills could therefore result in a **potentially significant impact** to fish species of primary management concern.

Direct Harm

In addition to the habitat alteration effects associated with construction, operation, and maintenance activities, these activities have some limited potential to directly “harm” juvenile and adult fishes by direct physical contact, including physical injury or mortality. However, because most equipment to be used during construction, operation, and maintenance activities would be located on land, the potential for direct physical harm would be minimal and is anticipated to result in a **less-than-significant impact** to fish species of primary management concern.

Hydrostatic Pressure Waves, Noise, and Vibration

A cofferdam would be constructed in the Sacramento River along the entire length of the intake structure (approximately 1,200 feet in length) and the isolated area would be subsequently dewatered to allow for construction of the Delevan Pipeline Intake Facilities. Because construction of the cofferdam would include vibratory pile driving in the Sacramento River, fishes in the vicinity could potentially be affected by underwater noise, pressure waves, and vibration. Vibration and pressure waves generated by construction, operation, and maintenance activities could potentially alter fish behavior in the Sacramento River, potentially leading to increased predation risk. Vibration and pressure could, therefore, result in a **potentially significant impact** to fish species of primary management concern.

During landside construction activities associated with the intake facilities, the potential would exist for vibration and pressure waves generated by construction and excavation activities to affect fish species in the Sacramento River. Operation and maintenance activities also may increase ambient underwater noise levels. However, the noise levels produced by both landside construction and excavation activities, and operation and maintenance activities, are not expected to reach a level that would harm juvenile or adult fishes. Because most construction and excavation activities are anticipated to occur above water, the noise levels under water would be much lower than those created in the air, and are anticipated to result in a **less-than-significant impact** to fish species of primary management concern.

Predation Risk

Construction of the intake facilities on the Sacramento River has the potential to provide habitat for non-native piscivorous predators, such as striped bass and centrarchids, which may result in increased predation risk for other fish species of primary management concern, including outmigrating juvenile salmonids. Increased predation risk associated with the construction of this facility could have a **potentially significant** impact on fish species of primary management concern.

Aquatic Habitat Modification

Activities such as river channel alteration, riparian vegetation and in-stream woody material (IWM) removal, and other in-stream work could potentially reduce biodiversity, macroinvertebrate production, and recolonization of disturbed substrate, as well as limit the exchange of nutrients between surface and subsurface waters and between aquatic and terrestrial ecosystems (USFWS, 2000).

Construction of the Delevan Pipeline Intake Facilities would include the modification and removal of shaded riverine aquatic (SRA) habitat (Figures 12-9 and 12-10). Preliminary estimates using GIS indicate that approximately 1.1 acres of Fremont Cottonwood riparian habitat that acts as SRA habitat, and an additional 0.5 acres of Valley Foothill Riparian habitat that may act as a source of IWM inputs to the Sacramento River, would be removed as a result of construction of the intake facilities. During a reconnaissance site visit conducted on February 23, 2011, available woody material was identified in the area. Examples include one piece of IWM (between six and eight inches in diameter and approximately 20 feet long) that was observed protruding from the river surface, and another piece of similar size that was identified immediately adjacent to the bank that could function as IWM at higher flows (Figure 12-10). The loss and degradation of SRA habitat within the construction footprints and within the access routes, staging areas, and storage and disposal areas could result in an impact to fish species through reduction in the quality of fish habitat and removal of important habitat elements.

Adult, juvenile, and early life stages of fish species of primary management concern could be present within and downstream of construction, operation, and maintenance areas year-round in the Sacramento River. Aquatic habitat removal and modification associated with construction of the intake facility on the Sacramento River would remove aquatic and riparian habitat, including SRA habitat, resulting in a **potentially significant impact** to fish species of primary management concern in the Sacramento River.

Maintenance activities may include replacement of existing riprap necessary to protect the conveyance features and facilities, which is anticipated to result in a **less-than-significant impact** to fish species of primary management concern because no additional habitat would be modified.

Fish Passage

Installation of a cofferdam to facilitate the construction of the intake facilities could potentially physically impede migrating adults, limiting their ability to reach spawning areas, and could hinder migration of juveniles, potentially exposing them to increased predation and unsuitable aquatic habitat conditions. In-stream construction activities also could impede upstream passage of fishes due to altered hydrologic conditions, such as temporarily increased velocities. However, because the cofferdam would only extend a short distance into the waterway (i.e., 40 feet), relative to the entire width of the Sacramento River, it is not anticipated that the movement or survival of juvenile or adult fish species of primary management concern would be substantially affected. Therefore, installation of a coffer dam is anticipated to result in a **less-than-significant impact** to fish species of primary management concern in the Sacramento River.

Stranding, Impingement and Entrainment

During installation of the cofferdam, any fish that are present potentially could be trapped behind the dam before closure. If individual fish do not exit through the partially enclosed cofferdam and return to the river, stranding of fishes could occur when the enclosed area is dewatered. Because some fish species of primary management concern may be in the vicinity of construction areas year-round, dewatering and in-river work during cofferdam placement and removal could result in fish impingement, entrainment, and stranding, which would result in a **potentially significant impact**.

Operation of the Delevan Pipeline Intake Facilities would also have the potential to entrain or impinge fish species of management concern, resulting in an adverse effect on fish species of primary management concern. However, the intakes would be designed to be protective of anadromous salmonids, and are anticipated to result in a **less-than-significant impact** to fish species of primary management concern.

Temperature Effects on the Sacramento River

Operation of the Delevan Pipeline Intake Facilities would include releases from Sites Reservoir to the Sacramento River. If release temperatures differ from the receiving waters of the Sacramento River, fish species of primary management concern could be adversely affected. However, preliminary modeling results indicate that in more than 98 percent of the months, Sites Reservoir releases would be within 0.5°F of the receiving Sacramento River water temperatures. Even though the model indicates a small number of months (<5%) with a likely cooling impact of 0.2°F or more, the Sites Reservoir temperature results show that it is possible to avoid such impacts by releasing from appropriate outlets. Only one month showed a cooling of more than 1°F in the 82 years. In a few years, mainly in an extended drought period when both Sites Reservoir storage and Sacramento River flow are low, releases from Sites Reservoir would be likely to cause warming of the receiving Sacramento River water. In less than one percent of the months the temperatures in the Sacramento River would increase by 1°F or more due to the releases from the Sites Reservoir. Approximately five percent of the months would likely have a warming impact of 0.2°F or more, although most of the months would be within the same year. The warming impact would mainly occur during September and October months. These slight changes to receiving water temperatures in the Sacramento River would not be expected to adversely affect fish species of primary management concern and are therefore considered to be **less than significant**.

Project Buffer

Erosion, Sedimentation and Turbidity

Ground-disturbing activities associated with the Project Buffer would include the construction of fences and the creation and maintenance of a fuelbreak around the perimeter of the buffer. These activities have the potential to cause erosion and contribute sediment to the creeks adjacent to the locations of these activities. It has been reported that behavioral avoidance of turbid waters may be one of the most important effects on fishes from suspended sediments (Birtwell et al., 1984; DeVore et al., 1980; Scannell, 1988). Because increased turbidity and sedimentation could cause temporary changes in fish behavior, the potential for predation also may be increased and could result in a **potentially significant impact** to fish species of primary management concern.

12.3.7 Impacts Associated with Alternative A Relative to the No Project/No Action Alternative

Potential impacts on fish species of primary management concern associated with implementation of Alternative A, relative to the No Project/No Action Alternative were evaluated in an identical manner to those described for the No Project/No Action Alternative, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area under Alternative A, relative to the No Project/No Action Alternative, is presented in Table 12-17. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative A, relative to the No Project/No Action Alternative, is presented in Table 12-18. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.7.1 Extended and Secondary Study Areas - Alternative A Relative to the No Project/No Action Alternative

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C. Construction-related impacts associated with implementation of Alternative A relative to the No Project/ No Action Alternative would be the same as those described for Alternative A relative to Existing Conditions. Operational impacts associated with Alternative A relative to the No Project/No Action Alternative are described below.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be more suitable in Trinity, Shasta, Oroville, and Folsom reservoirs under Alternative A, relative to the No Project/No Action Alternative. Specifically, within the Secondary Study Area, end-of-month storage generally would be greater more frequently under Alternative A, relative to the No Project/No Action Alternative in each of the SWP/CVP reservoirs evaluated. Reservoir coldwater fish species habitat conditions would be similar in San Luis Reservoir, and similar or slightly more suitable in export service area reservoirs due to generally increased SWP and

CVP exports occurring more often and resulting in increased storage in San Luis Reservoir and potentially increased storage in other export service area reservoirs.

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on reservoir coldwater fish species in San Luis and other export service area reservoirs are considered **less-than-significant**, and impacts on coldwater fish species in Trinity, Shasta, Oroville, and Folsom reservoirs are considered **potentially beneficial**.

Reservoir Warmwater Fish Species

Reservoir warmwater fish species habitat conditions would be similar or more suitable under Alternative A, relative to the No Project/No Action Alternative in Trinity and Shasta reservoirs because water surface elevation reductions of six feet or more during the warmwater fish nesting season would occur less frequently. Therefore, fewer nest dewatering events are anticipated. Water surface elevation reductions of six feet or more would be similar in Oroville and Folsom reservoirs. Therefore, impacts on reservoir warmwater fish species are anticipated to be similar. Habitat conditions in San Luis Reservoir are anticipated to be slightly less suitable because of increased frequency of water surface elevation reductions of six feet or more during March, while more frequent increases in exports are anticipated to increase habitat suitability for warmwater fish species inhabiting other export service area reservoirs.

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, San Luis, and other export service area reservoirs are considered **less than significant**.

Southern Oregon/Northern California Coho Salmon

In general, habitat conditions in the Trinity River would be similar or more suitable under Alternative A, relative to the No Project/No Action Alternative because flows would be generally similar during most life stages, while water temperature index values would be generally exceeded less frequently during all life stages (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to the No Project/No Action Alternative, potential impacts on Coho salmon in the Trinity River are considered **less than significant**.

Upper Klamath-Trinity River Fall-Run and Spring-Run Chinook Salmon

In general, during the periods when Chinook salmon are present in the Trinity River, habitat conditions, as well as early life stage mortality, would be similar or more suitable under Alternative A, relative to the No Project/No Action Alternative because flows would be generally similar but slightly higher during some life stages, while water temperature index values would be generally exceeded less frequently during all life stages (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to the No Project/No Action Alternative, potential impacts on spring-run and fall-run Chinook salmon in the Trinity River are considered **less than significant**.

Klamath Mountains Province Steelhead

In general, during the periods when steelhead are present in the Trinity River, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative (see Appendix 12C for a detailed discussion).

Therefore, under Alternative A, relative to the No Project/No Action Alternative, potential impacts on spring-run Chinook salmon in the Trinity River are considered **less than significant**.

Sacramento River Winter-Run Chinook Salmon

In general, during periods when winter-run Chinook salmon are present in the Sutter Bypass, Delta, and bays downstream of the Delta, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. Habitat conditions in the Sacramento River would be generally more suitable due to increased flows and decreased water temperatures during low flow conditions, increased spawning habitat availability and reduced water temperatures during spawning, reduced early life stage mortality, reduced population mortality and increased production potential, and increased spawner abundance (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on winter-run Chinook salmon in the Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**, and impacts on winter-run Chinook salmon in the Sacramento River are **potentially beneficial**.

Central Valley Spring-Run Chinook Salmon

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in the Sacramento River would be more suitable, and would be similar or more suitable in Clear Creek. Specifically, in the Sacramento River flows would be higher more frequently during low flow conditions, and water temperatures would be lower more frequently near Keswick Dam where spawning occurs. Additionally, these conditions would result in reduced early life stage mortality, reduced population mortality, and increased production potential. In Clear Creek, slightly lower water temperatures would occur more frequently (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on spring-run Chinook salmon in Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**, and impacts on spring-run Chinook salmon in the Sacramento River are considered **potentially beneficial**.

Central Valley Fall-Run Chinook Salmon

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in Clear Creek would be similar or more suitable due to slightly decreased water temperatures during spawning. Additionally, habitat conditions in the American River would be similar or more suitable due to slightly improved habitat conditions during some life stages (see Appendix 12C for a detailed discussion). Specifically, decreased flows and increased water temperatures, as well as increased early life stage mortality, would result from implementation of the No Project/No Action Alternative.

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on fall-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**.

Central Valley Late Fall-Run Chinook Salmon

In general, during periods when late fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on late fall-run Chinook salmon in the Sacramento River, Clear Creek, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**.

Central Valley Steelhead

In general, during periods when steelhead are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing and emigration, as a result of decreased frequency of inundation (as identified by reduced Yolo Bypass outflow), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on steelhead in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on steelhead in the Yolo Bypass are considered **potentially significant**.

Green Sturgeon

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to the No Project/No Action Alternative. Specifically, habitat conditions in the Trinity River, Sacramento River, and American River would be generally more suitable, while conditions in the Feather River would be similar. In the Trinity River, flows would be higher more often during adult immigration, and water temperatures would be lower more often during spawning. In the Sacramento River, particularly in the lower reaches, habitat conditions would be more suitable due to generally higher flows occurring more often during low flow conditions, and generally lower water temperatures occurring more often. In the American River, flows would be higher slightly more often during most life stages, and water temperatures would be slightly lower more often during juvenile rearing and emigration. However, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing due to a decreased frequency of floodplain activation, which would result in reduced floodplain rearing opportunities and reduced nutrient inflow to the Delta and bays (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, potential operational impacts on green sturgeon in the Trinity River, Sacramento River, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts to green sturgeon in the Yolo Bypass are considered **potentially significant**.

White Sturgeon

In general, during periods when white sturgeon are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, simulated habitat conditions would be similar or less suitable in the Feather River due to generally similar changes in flows and water temperatures during most life stages, but with lower flows occurring more frequently during the spawning and embryo incubation period. Additionally, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing due to a decreased frequency of floodplain activation, which would result in reduced floodplain rearing opportunities and reduced nutrient inflow to the Delta and bays (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on white sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on white sturgeon in the Yolo Bypass are considered **potentially significant**.

Pacific Lamprey

In general, during periods when Pacific lamprey are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in American River would be similar during most years, but would be more suitable for all life stages due to increased flows and decreased water temperatures occurring more frequently. Additionally, habitat conditions in the Feather River would be similar or less suitable during spawning and egg incubation due to inconsistent conditions of increased and decreased flows occurring more frequently in the downstream reaches of the river, as well as increased water temperatures occurring more frequently (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on Pacific lamprey in the Trinity River, Sacramento River, Clear Creek, Feather River, Delta, and bays are considered **less than significant**, and impacts on Pacific lamprey in the American River are considered **potentially beneficial**.

River Lamprey

In general, during periods when river lamprey are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in American River would be similar during most years, but would be more suitable for all life stages due to increased flows and decreased water temperatures occurring more frequently. Additionally, habitat conditions in the Feather River would be similar or less suitable during adult immigration, and for spawning and egg incubation due decreased flows occurring slightly more frequently in the downstream reaches of the river, as well as increased water temperatures occurring slightly more frequently (see Appendix 12C for a detailed discussion). While Feather River conditions would be slightly less suitable for immigration and spawning life stages, these conditions would occur in the lower reaches of the river where spawning occurs infrequently, if it occurs downstream of the Thermalito Afterbay.

Overall, under Alternative A, relative to the No Project/No Action Alternative, potential operational impacts on river lamprey in the Sacramento River, Clear Creek, Feather River, Delta and bays are considered **less than significant**, and impacts on river lamprey in the American River are considered **potentially beneficial**.

Hardhead

In general, during periods when hardhead are present in the Sacramento River and Clear Creek, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative.

Habitat conditions in the Feather River would be similar or more suitable during spawning due to increased flows and suitable water temperatures occurring more often, particularly during low flow conditions. However, habitat conditions in the Feather River would be similar or less suitable due to lower flows occurring more often during portions of the spawning period (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on hardhead in the Sacramento River, Clear Creek, Feather River, and American River are considered **less than significant**.

California Roach

Within the Secondary Study Area and refuges in the Extended Study Area, during periods when roach are present in the water bodies evaluated, habitat conditions generally would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in the American River would be similar or more suitable for spawning due to increased flows and decreased water temperatures occurring more frequently (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, operational impacts on California roach in the Sacramento River, Clear Creek, Feather River, American River, and Level 4 refuges are considered **less than significant**.

Delta Smelt

In general, during periods when delta smelt are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative A, relative to the No Project/No Action Alternative. Specifically, most analyses indicate that habitat conditions would be similar, but downstream movement of X2 location indicates that more suitable habitat conditions would occur during wet, above normal, and below normal water years. Reductions in Yolo Bypass outflow could potentially reduce habitat suitability for delta smelt by reducing nutrient inflow to the Delta. However, improved X2 location during some years could improve juvenile conditions by allowing juveniles to rear in more suitable locations near Suisun and San Pablo bays.

Therefore, under Alternative A, relative to the No Project/No Action Alternative, impacts on delta smelt in the Delta and bays are considered **less than significant**.

Longfin Smelt

In general, during periods when longfin smelt are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative.

Therefore, under Alternative A, relative to the No Project/No Action Alternative, impacts on longfin smelt in the Delta and bays are considered **less than significant**.

Sacramento Splittail

Habitat conditions in the American River under Alternative A, relative to the No Action/No Project Alternative would be similar or more suitable during the splittail spawning period due to increased flows occurring more often, particularly during low flow years. In the Feather River, habitat conditions would be similar or slightly less suitable due to decreased flows occurring more often during portions of the spawning period. Additionally, reduced flows into and out of the Yolo Bypass would result in less suitable habitat conditions for splittail spawning. Because of the importance of the Yolo Bypass to splittail population abundance, reduced floodplain inundation in the Yolo Bypass would constitute a substantial impact (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, potential operational impacts on splittail in the Feather River, American River, Sutter Bypass, Delta, and Level 4 refuges are considered **less than significant**, and impacts on splittail in the Yolo Bypass are considered **potentially significant**.

Striped Bass

In general, during periods when striped bass are present in the evaluated water bodies, habitat conditions would be similar under Alternative A, relative to the No Project/No Action Alternative. However, habitat conditions in the American River would be more suitable due to increased flows and water temperatures within the evaluated range occurring more frequently for all life stages. Additionally, in the Feather River habitat conditions would be similar or less suitable due to reduced flows occurring more frequently during some months of the spawning period (see Appendix 12C for a detailed discussion).

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on striped bass in the Sacramento River, Feather River, Delta, and bays are considered **less than significant**, and impacts on striped bass in the American River are considered **potentially beneficial**.

American Shad

Operations-related impacts on American shad would be similar to those described for striped bass under Alternative A, relative to the No Project/No Action Alternative.

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on American shad in the Sacramento River, Feather River, Delta, and bays are considered **less than significant**, and impacts on American shad in the American River are considered **potentially beneficial**.

Largemouth Bass

In general, during periods when largemouth bass are present in the evaluated water bodies, habitat conditions would be similar under the No Project/No Action Alternative, relative to the Existing Condition. However, habitat conditions in the Yolo Bypass would be less suitable for adults feeding on rearing juvenile fishes in the bypass, as well as juvenile largemouth bass rearing, due to decreased frequency of inundation (as identified by reduced Yolo Bypass outflow), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion). Additionally, habitat availability in the Delta would be increased during the summer and fall due to reduced EC at various locations.

Therefore, for Alternative A, relative to the No Project/No Action Alternative, potential impacts on largemouth bass in the Sacramento River, Feather River, American River, and Delta are considered **less than significant**, and impacts on largemouth bass in the Yolo Bypass are considered **potentially significant**.

12.3.7.2 Primary Study Area - Alternative A Relative to the No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Refer to the **Impact Fish-1** Primary Study Area discussion for Alternative A relative to Existing Conditions. That discussion also applies to Alternative A relative to the No Project/No Action Alternative.

12.3.8 Impacts Associated with Alternative B Relative to Existing Conditions

Potential impacts on fish species of primary management concern associated with implementation of Alternative B, relative to Existing Conditions, were evaluated in an identical manner to those described for Alternative A, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area under Alternative B, relative to Existing Conditions, is presented in Table 12-19. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative B, relative to Existing Conditions, is presented in Table 12-20. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.8.1 Extended and Secondary Study Areas - Alternative B Relative to Existing Conditions

The impacts associated with Alternative B relative to Existing Conditions, as they relate to fish species of primary management concern (**Impact Fish-1**), would be the same as described for Alternative A relative to Existing Conditions for the following species within the Extended and Secondary study areas:

- Southern Oregon / Northern California Coho
- Upper Klamath / Trinity fall and spring-run Chinook salmon
- Klamath Mountains Province steelhead
- Sacramento River winter-run Chinook salmon
- Central Valley spring-run Chinook salmon
- Central Valley late fall-run Chinook salmon
- Central Valley steelhead
- White sturgeon
- Pacific lamprey
- River lamprey
- Hardhead
- Delta smelt
- Longfin smelt
- Striped bass
- American shad
- Largemouth bass

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C. Construction-related impacts associated with implementation of Alternative B, relative to Existing Conditions, on all fish species of primary management concern would be the same as those described for Alternative A relative to Existing Conditions. Operational impacts associated with Alternative B relative to Existing Conditions that would differ from those described for Alternative A, relative to Existing Conditions, are described below.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be similar or more suitable in Trinity, Shasta and Oroville reservoirs under Alternative B, relative to Existing Conditions, due to generally higher reservoir storages occurring more often. Reservoir coldwater fish species habitat conditions would be similar in Folsom Reservoir due to generally similar reservoir storages. Simulated habitat conditions would be similar or less suitable in San Luis Reservoir, and similar or generally more suitable in export service area reservoirs due to reduced storage that would occur more often in San Luis Reservoir, and potentially increased storage in other export service area reservoirs due to increased SWP/CVP exports.

Therefore, for Alternative B, relative to Existing Conditions, potential impacts on reservoir coldwater fish species in Oroville, Folsom, and San Luis reservoirs are considered **less than significant,** and impacts to coldwater fish species in Trinity, Shasta, and other export service area reservoirs are considered **potentially beneficial**.

Reservoir Warmwater Fish Species

Reservoir warmwater fish species habitat conditions would be similar or more suitable under Alternative B, relative to Existing Conditions, in Trinity and Shasta reservoirs because fewer water surface elevation reductions of six feet or more would occur during the warmwater fish nesting season. Therefore, fewer nest dewatering events would be anticipated. Water surface elevation reductions of six feet or more would occur with similar frequencies in Oroville and Folsom reservoirs. Therefore, habitat conditions for warmwater fish species are anticipated to be similar in Oroville and Folsom reservoirs. Habitat conditions in San Luis Reservoir are anticipated to be slightly less suitable because of increased frequencies of water surface elevation reductions of six feet or more, while increases in exports more often are anticipated to increase habitat suitability for warmwater fish species inhabiting other export service area reservoirs.

Therefore, for Alternative B, relative to Existing Conditions, potential impacts on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs are considered less than significant, and impacts to warmwater fish species in other export service area reservoirs are considered **potentially beneficial**.

Central Valley Fall-Run Chinook Salmon

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative B, relative to Existing Conditions. Habitat conditions would be similar to those discussed under Alternative A, relative to Existing Conditions, except that conditions for fall-run Chinook salmon in the Sacramento River would be similar instead of similar/more suitable due to reduced spawning habitat availability. Habitat conditions in the American River would be substantially less suitable during all life stages (see Appendix 12C for a detailed discussion). Specifically, decreased flows and increased water temperatures, as well as increased early life stage mortality, would occur more frequently as a result of implementation of Alternative B.

Overall, under Alternative B, relative to Existing Conditions, potential operational impacts on fall-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**. On the American River under Alternative B relative to Existing Conditions, impacts on fall-run Chinook salmon would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative B, the potential operational impacts on fall-run Chinook salmon are considered to be **less than significant**.

Green Sturgeon

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative B, relative to Existing Conditions. Habitat conditions would be generally similar to those described under Alternative A, relative to Existing Conditions, except that habitat conditions in the Trinity River would be considered similar instead of similar/more suitable due to similar flow and water temperature conditions. Habitat conditions in the American River would be substantially less suitable during all green sturgeon life stages due to decreased flows more often and increased water temperatures occurring with similar or higher frequencies, particularly during low flow conditions. Habitat conditions in the Yolo Bypass also would be less suitable for juvenile rearing and emigration as a result of decreased frequency of inundation (as identified by reduced Yolo Bypass outflow more often), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion).

Overall, under Alternative B, relative to Existing Conditions, potential operational impacts on green sturgeon in the Trinity River, Sacramento River, Feather River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on green sturgeon in the Yolo Bypass are considered **potentially significant**. On the American River under Alternative B relative to Existing Conditions, impacts on green sturgeon would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative B, the potential operational impacts on green sturgeon are considered to be **less than significant**.

California Roach

Within the Secondary Study Area, during periods when roach are present in the Sacramento, Feather and American rivers, habitat conditions generally would be similar under Alternative B, relative to Existing Conditions. Habitat conditions would be generally similar to those discussed under Alternative A relative to Existing Conditions, except that habitat conditions in the Feather River would be similar or less suitable instead of similar, due to reduced flows more often during the spawning period. Habitat conditions in Clear Creek would be similar during most years, but would be more suitable for spawning during low flow conditions as a result of increased flows occurring more often. Habitat conditions for roach within the Level 4 refuges in the Extended Study Area are anticipated to be similar under Alternative B, relative to Existing Conditions.

Overall, under Alternative B, relative to Existing Conditions, potential operational impacts on California roach in the Sacramento River, Clear Creek, Feather River, and American River and Level 4 refuges are considered **less than significant**.

Sacramento Splittail

In general, during periods when splittail are present in the evaluated water bodies, habitat conditions would be similar under Alternative B, relative to the Existing Condition in the Sutter Bypass, and similar or less suitable in the Feather and American rivers. Habitat conditions in the Feather and American rivers would be slightly less suitable for spawning due to decreased flows and reduced useable flooded area occurring slightly more often. The reduction in usable flooded area slightly more often is not anticipated to result in a substantial impact to splittail in the Feather and American rivers. Habitat conditions for splittail within the Level 4 refuges in the Extended Study Area are anticipated to be similar under Alternative B, relative to Existing Conditions. However, reduced flows into and out of the Yolo Bypass would result in substantially less suitable habitat conditions for splittail spawning. Because of the importance of the Yolo Bypass to splittail population abundance, reduced floodplain inundation in the Yolo Bypass would constitute a substantial impact (see Appendix 12C for a detailed discussion).

Therefore, under Alternative B, relative to Existing Conditions, potential operational impacts on splittail in the Feather River, American River, Sutter Bypass, Delta, and Level 4 refuges are considered **less than significant**, and impacts on splittail in the Yolo Bypass are considered **potentially significant**.

Ecosystem Enhancement Storage Account and Ecosystem Enhancement Fund

Refer to the EESA and EEF discussions for Alternative A relative to Existing Conditions. That discussion applies to all three action alternatives.

12.3.8.2 Primary Study Area – Alternative B Relative to Existing Conditions

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to aquatic biological resources:

- Sites Reservoir Inlet/Outlet Structure
- Sites Pumping/Generating Plant
- Holthouse Reservoir Complex

- GCID Canal Facilities Modifications
- TRR to Funks Creek Pipeline
- Delevan Pipeline

The Alternative B saddle dam access roads included in the Road Relocations and South Bridge feature would differ from Alternative A, but Eastside Road would have the same alignment over Funks Creek and would require the same construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impacts on fish species of primary management concern (**Impact Fish-1**) as described for Alternative A.

The Alternative B Sites Reservoir would require the construction of two more saddle dams than the Alternative A reservoir. However, these additional saddle dams would not be located within or adjacent to a waterway. The Alternative B dams would therefore have the same impacts on fish species of primary management concern (**Impact Fish-1**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impacts on fish species of primary management concern (**Impact Fish-1**) as described for Alternative A.

The Alternative B Sites Reservoir would be larger than the Alternative A reservoir. In addition, Alternative B would replace the Delevan Pipeline Intake Facilities with the smaller Delevan Pipeline Discharge Facility. Potential impacts to aquatic biological resources associated with these proposed Project features that would differ from Alternative A are discussed below.

Sites Reservoir Inundation Area

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Aquatic Habitat Modification

Construction of a larger Sites Reservoir would have similar potential impacts to aquatic biological resources as discussed for Alternative A, except that construction of Sites Reservoir (1.81 MAF under Alternative B vs. 1.27 MAF under Alternative A) would eliminate and inundate approximately four miles of Stone Corral Creek and seven miles of Funks Creek upstream of the Sites Reservoir dams, compared to 3.9 miles of Stone Corral Creek and 6.5 miles of Funks Creek under Alternative A. Aquatic habitat removal and modification, specifically the inundation of Funks and Stone Corral creeks associated with the construction of Sites Reservoir, would result in a **potentially significant impact** to fish species of primary management concern.

Delevan Pipeline Discharge Facility

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified

as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Hydrostatic Pressure Waves, Noise and Vibration

Under Alternative B a cofferdam would be constructed in the Sacramento River along the entire length of the discharge facility (approximately 350 feet in length) and subsequently dewatered to allow for construction of the facility. Potential impacts to fisheries resources associated with the coffer dam construction would be similar to those discussed for the Delevan Pipeline Intake Facilities under Alternative A and could, therefore, result in a **potentially significant impact** to fish species of primary management concern.

Predation Risk

Potential impacts to fisheries resources associated with predation risk during construction, operation, and maintenance of the discharge facility would be similar to those discussed for the intake facilities under Alternative A. However, because Alternative B would only include a discharge facility without diversion capabilities, the facility footprint would be smaller than the intake facility under Alternative A. This smaller footprint would reduce the amount of riparian and aquatic habitat impacted, and therefore, reduce the potential for non-native predatory fish habitat creation. Despite the reduced potential in comparison to Alternative A, increased predation risk associated with the construction of this facility could have a **potentially significant** impact on fish species of primary management concern.

Aquatic Habitat Modification

The footprint of the smaller discharge facility is estimated to displace approximately 1.5 acres of Fremont Cottonwood riparian habitat that may act as SRA habitat, and approximately 0.1 acre of Valley Foothill Riparian habitat (compared to 1.1 acres and 0.5 acre of Fremont Cottonwood and Valley Foothill Riparian habitat types, respectively, under Alternative A), which may act as a source of IWM inputs to the Sacramento River. The removal of SRA habitat would result in a **potentially significant impact** to fish species of primary management concern in the Sacramento River.

Changes to Sacramento River Water Temperature

Water release temperatures from Sites Reservoir through the Delevan Pipeline Discharge Facility are expected to be the same as described for the Delevan Pipeline Intake Facilities and are therefore considered to be **less than significant**.

12.3.9 Impacts Associated with Alternative B Relative to the No Project/No Action Alternative

Potential impacts on fish species of primary management concern associated with implementation of Alternative B, relative to the No Project/No Action Alternative, were evaluated in an identical manner to those described for the No Project/No Action Alternative, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area under Alternative B, relative to the No Project/No Action Alternative, is presented in Table 12-21. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative B, relative to the No Project/No Action Alternative, is presented in Table 12-22. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.9.1 Extended and Secondary Study Areas - Alternative B Relative to the No Project/No Action Alternative

The impacts associated with Alternative B relative to the No Project/No Action Alternative, as they relate to fish species of primary management concern (**Impact Fish-1**), would be the same as described for Alternative A relative to the No Project/No Action Alternative for the following species within the Extended and Secondary study areas:

- Klamath Mountains Province steelhead
- Sacramento River winter-run Chinook salmon
- Central Valley fall-run Chinook salmon
- Central Valley late fall-run Chinook salmon
- White sturgeon
- Pacific lamprey
- River lamprey
- Hardhead
- California roach
- Delta smelt
- Longfin smelt
- Sacramento splittail
- Largemouth bass

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C. Construction-related impacts associated with implementation of Alternative B, relative to the No Project/No Action Alternative, on all fish species of primary management concern would be the same as those described for Alternative A relative to Existing Conditions. Operational impacts associated with Alternative B relative to the No Project/No Action Alternative that would differ from those described for Alternative A relative to the No Project/No Action Alternative are described below.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be more suitable in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs under Alternative B, relative to the No Project/No Action Alternative.

Specifically, within the Secondary Study Area, end-of-month storage generally would be greater under Alternative B, relative to the No Project/No Action Alternative in each of the SWP/CVP reservoirs evaluated. Reservoir coldwater fish species habitat conditions would also be anticipated to be more suitable in export service area reservoirs due to generally increased SWP and CVP exports occurring more frequently and potentially resulting in increased storage in export service area reservoirs.

Therefore, for Alternative B, relative to the No Project/No Action Alternative, potential impacts on reservoir coldwater fish species in Trinity, Shasta, Oroville, Folsom, San Luis, and other export service area reservoirs are considered **potentially beneficial**.

Reservoir Warmwater Fish Species

Reservoir warmwater species habitat conditions would be similar or more suitable under Alternative B, relative to the No Project/No Action Alternative in Trinity and Shasta reservoirs because water surface elevation reductions of six feet or more during the warmwater fish nesting season would occur less frequently. Therefore, fewer nest dewatering events are anticipated. Water surface elevation reductions of six feet or more would be similar in Oroville, Folsom, and San Luis reservoirs. Therefore, impacts on reservoir warmwater fish species are anticipated to be similar. Reservoir warmwater fish species habitat conditions are anticipated to be more suitable in export service area reservoirs due to generally increased SWP and CVP exports that would occur more frequently and potentially result in increased littoral habitat in export service area reservoirs.

Therefore, for Alternative B, relative to the No Project/No Action Alternative, potential impacts on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs are considered **less than significant**, and impacts on warmwater fish species in other export service area reservoirs are considered **potentially beneficial**.

Southern Oregon/Northern California Coho Salmon

In general, simulated habitat conditions in the Trinity River would be similar under Alternative B, relative to the No Project/No Action Alternative (see Appendix 12C for a detailed discussion).

Therefore, under Alternative B, relative to the No Project/No Action Alternative, potential impacts on Coho salmon in the Trinity River are considered **less than significant**.

Upper Klamath-Trinity River Fall-Run and Spring-Run Chinook Salmon

In general, during the periods when Chinook salmon are present in the Trinity River, habitat conditions, as well as early life stage mortality, would be similar under Alternative B, relative to the No Project/No Action Alternative (see Appendix 12C for a detailed discussion).

Therefore, under Alternative B, relative to the No Project/No Action Alternative, potential impacts on spring-run and fall-run Chinook salmon in the Trinity River are considered **less than significant**.

Central Valley Spring-Run Chinook Salmon

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative B, relative to the No Project/No Action Alternative. However, habitat conditions in the Sacramento River and Clear Creek would be similar or more suitable. Specifically, in the Sacramento River, habitat conditions would be generally similar during most life stages, but flows would be higher and water temperatures would be lower more frequently during spawning and embryo incubation. Additionally, these conditions would result in reduced early life stage mortality, reduced population mortality, and increased production potential. Habitat conditions in Clear Creek would be similar or more suitable because slightly lower water temperatures would occur more frequently (see Appendix 12C for a detailed discussion).

Overall, under Alternative B, relative to the No Action Alternative, potential operational impacts on spring-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**.

Central Valley Steelhead

In general, during periods when steelhead are present in the evaluated water bodies, habitat conditions would be similar under Alternative B, relative to the No Project/No Action Alternative. However, habitat conditions in the American River would be similar or more suitable because flows would be increased more frequently during most life stages. Additionally, spawning habitat availability would be greater in the American River under Alternative B, relative to the No Project/No Action Alternative. However, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing and emigration, as a result of decreased frequency of inundation (as identified by reduced Yolo Bypass outflow), and potentially reduced Delta productivity as a result of decreased Yolo Bypass inundation frequency (see Appendix 12C for a detailed discussion).

Overall, under Alternative B, relative to the No Action Alternative, potential operational impacts on steelhead in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on steelhead in the Yolo Bypass are considered **potentially significant**.

Green Sturgeon

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar under Alternative B, relative to the No Project/No Action Alternative. Additionally, habitat conditions in the Sacramento River would be generally similar or more suitable due to generally higher flows that would occur more often and occur more often during low flow conditions. However, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing due to a decreased frequency of floodplain activation, which results in reduced floodplain rearing opportunities and reduced nutrient inflow to the Delta and bays (see Appendix 12C for a detailed discussion).

Overall, under Alternative B, relative to the No Action Alternative, potential operational impacts on green sturgeon in the Trinity River, Sacramento River, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on green sturgeon in the Yolo Bypass are considered **potentially significant**.

Striped Bass

In general, during periods when striped bass are present in the evaluated water bodies, habitat conditions would be similar under Alternative B, relative to the No Project/No Action Alternative. However, habitat conditions in the American River would be similar or more suitable due to increased flows that would occur more frequently during most months of all life stages, although reduced flows would occur more frequently (see Appendix 12C for a detailed discussion).

Therefore, for Alternative B, relative to the No Project/No Action Alternative, potential impacts on striped bass in the Sacramento River, Feather River, American River, Delta, and bays are considered **less than significant**.

American Shad

Operations-related impacts on American shad would be similar to those described for striped bass under Alternative B, relative to the No Project/No Action Alternative, and are considered **less than significant**.

12.3.9.2 Primary Study Area – Alternative B Relative to the No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Refer to the **Impact Fish-1** Primary Study Area discussion for Alternative B relative to Existing Conditions. That discussion also applies to Alternative B relative to the No Project/No Action Alternative.

12.3.10 Impacts Associated with Alternative C Relative to Existing Conditions

Potential impacts on fish species of primary management concern associated with implementation of Alternative C, relative to Existing Conditions, were evaluated in an identical manner to those described for Alternative A, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area under Alternative C, relative to Existing Conditions, is presented in Table 12-23. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative C, relative to Existing Conditions, is presented in Table 12-24. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.10.1 Extended and Secondary Study Areas - Alternative C Relative to Existing Conditions

The impacts associated with Alternative C relative to Existing Conditions, as they relate to fish species of primary management concern (**Impact Fish-1**), would be the same as described for Alternative A relative to Existing Conditions for the following species within the Extended and Secondary study areas:

- Southern Oregon / Northern California Coho
- Upper Klamath / Trinity fall and spring-run Chinook salmon
- Klamath Mountains Province steelhead
- Central Valley steelhead
- Green sturgeon
- White sturgeon
- Pacific lamprey
- River lamprey
- Hardhead
- California Roach
- Delta smelt
- Longfin smelt

- Striped bass
- American shad
- Largemouth bass

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C**.** Construction-related impacts associated with implementation of Alternative C, relative to Existing Conditions, on all fish species of primary management concern would be the same as those described for Alternative A relative to Existing Conditions. Operational impacts associated with Alternative C relative to Existing Conditions that would differ from those described for Alternative A, relative to Existing Conditions, are described below.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be similar or more suitable in Trinity, Shasta and Oroville reservoirs under Alternative C, relative to Existing Conditions, due to generally higher reservoir storages that would occur more often. Coldwater fisheries habitat conditions would be generally similar to conditions under Alternative A relative to Existing Conditions, except that conditions would be similar or more suitable in Folsom Reservoir instead of more suitable, due to more similar reservoir storages. Habitat conditions would be similar or less suitable in San Luis Reservoir, and more suitable in export service area reservoirs due to reduced storage that would occur more often in San Luis Reservoir and potentially increased storage in other export service area reservoirs due to increased SWP/CVP exports.

Therefore, for Alternative C, relative to Existing Conditions, potential impacts on reservoir coldwater fish species in Oroville, Folsom, and San Luis reservoirs are considered **less than significant**, and impacts on coldwater fish species in Trinity, Shasta, and other export service area reservoirs are considered **potentially beneficial**.

Reservoir Warmwater Fish Species

Reservoir warmwater species habitat conditions would be similar or more suitable under Alternative C, relative to Existing Conditions, in Trinity and Shasta reservoirs because fewer water surface elevation reductions of six feet or more would occur during the warmwater fish nesting season. Therefore, fewer nest dewatering events would be anticipated. Warmwater fisheries habitat conditions would be similar to conditions under Alternative A, relative to Existing Conditions, except that conditions in Shasta Lake would be more suitable instead of similar or more suitable, due to reduced water surface elevation reductions. Simulated water surface elevation reductions of six feet or more would occur with similar frequency in Oroville Reservoir, and would occur with slightly higher frequencies in Folsom Reservoir. Therefore, habitat conditions for warmwater species are anticipated to be similar in Oroville Reservoir and slightly less suitable in Folsom Reservoir. Habitat conditions in San Luis Reservoir are anticipated to be slightly less suitable because of expected increased frequencies of water surface elevation reductions of six feet or more, while increases in exports that would occur more often are anticipated to increase habitat suitability for warmwater species inhabiting other export service area reservoirs.

Therefore, for Alternative C, relative to Existing Conditions, potential impacts on reservoir warmwater fish species in Trinity, Oroville, Folsom, and San Luis reservoirs are considered **less than significant**, and impacts on warmwater fish species in Shasta and other export service area reservoirs are considered **potentially beneficial**.

Sacramento River Winter-Run Chinook Salmon

In general, during periods when winter-run Chinook salmon are present in the Sutter Bypass, Delta, and bays downstream of the Delta, habitat conditions would be similar or more suitable under Alternative A, relative to Existing Conditions. Habitat conditions in the Sacramento River would be generally more suitable as a result of more suitable spawning and embryo incubation conditions that would occur more often, while habitat conditions in the Delta would be more suitable due to generally higher juvenile survival that would occur more often through the Delta (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to Existing Conditions, potential operational impacts on winter-run Chinook salmon in the Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**, and impacts on winter-run Chinook salmon in the Sacramento River are considered **potentially beneficial**.

Central Valley Spring-Run Chinook Salmon

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar or more suitable under Alternative C, relative to Existing Conditions, due to increased flows that would occur more often and reduced water temperatures that would occur more often. Habitat conditions under Alternative C would be similar to conditions under Alternative A relative to Existing Conditions, except that conditions in the Sacramento River are considered similar or more suitable instead of more suitable, due to slightly less suitable flows and water temperatures during October. In addition, Delta habitat conditions are considered similar under Alternative C instead of similar or more suitable under Alternative A relative to Existing Conditions, due to generally similar through Delta survival. Habitat conditions in the American River for non-natal juvenile spring-run Chinook salmon would be generally similar or slightly less suitable due to reduced flows that would occur more frequently under Alternative C, relative to Existing Conditions. However, it is not anticipated that these habitat conditions would substantially affect spring-run Chinook salmon, particularly because the American River only supports non-natal juvenile rearing (see Appendix 12C for a detailed discussion).

Overall, under Alternative C, relative to Existing Conditions, potential operational impacts on spring-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**.

Central Valley Fall-Run Chinook Salmon

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be generally similar or more suitable under Alternative C, relative to Existing Conditions. Habitat conditions would be similar to those discussed under Alternative A relative to Existing Conditions, except that conditions for fall-run Chinook salmon in the Sacramento River would be considered similar instead of similar or more suitable due to reduced spawning habitat availability. Habitat conditions in the American River would be substantially less suitable during all life stages (see Appendix 12C for a detailed discussion). Specifically, decreased flows and increased water temperatures, as well as increased early life stage mortality, would occur more frequently as a result of implementation of Alternative C.

Overall, under Alternative C, relative to Existing Conditions, potential operational impacts on fall-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**. On the American River under Alternative C relative to Existing Conditions, impacts on fall-run Chinook salmon would be considered potentially significant. However, these impacts would occur with or without implementation of the proposed Project and are therefore not considered to be Project-related impacts. Because these adverse changes in flows and temperatures would not be caused by implementation of Alternative C, the potential operational impacts on fall-run Chinook salmon are considered to be **less than significant**.

Sacramento Splittail

In general, during periods when splittail are present in the evaluated water bodies, habitat conditions would be generally similar under Alternative C, relative to Existing Conditions in the Sutter Bypass, and would be similar or less suitable in the Feather and American rivers. Habitat conditions in the Feather and American rivers would be slightly less suitable for spawning due to decreased flows and reduced useable flooded area that would occur slightly more often. The reduction in usable flooded area that would occur slightly more often is not anticipated to result in a substantial impact to splittail in the Feather and American rivers. Habitat conditions for splittail within the Level 4 refuges in the Extended Study Area are anticipated to be similar under Alternative C, relative to Existing Conditions. However, reduced flows into and out of the Yolo Bypass would result in substantially less suitable habitat conditions for splittail spawning. Because of the importance of the Yolo Bypass to splittail population abundance, reduced floodplain inundation in the Yolo Bypass would constitute a substantial impact (see Appendix 12C for a detailed discussion).

Therefore, under Alternative C, relative to Existing Conditions, potential operational impacts on splittail in the Feather River, American River, Sutter Bypass, Delta, and Level 4 refuges are considered **less than significant**, and impacts on splittail in the Yolo Bypass are considered **potentially significant**.

Ecosystem Enhancement Storage Account and Ecosystem Enhancement Fund

Refer to the EESA and EEF discussions for Alternative A relative to Existing Conditions. That discussion applies to all three action alternatives.

12.3.10.2 Primary Study Area – Alternative C Relative to Existing Conditions

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to aquatic biological resources:

- Sites Reservoir Inlet/Outlet Structure
- Sites Pumping/Generating Plant
- Holthouse Reservoir Complex
- GCID Canal Facilities Modifications
- TRR to Funks Creek Pipeline
- Delevan Pipeline

The Alternative C Road Relocations and South Bridge feature would include the same alignment of Eastside Road over Funks Creek as Alternative A. Therefore, the impacts of the road relocations on fish species of primary management concern (**Impact Fish-1**) would be the same as described for Alternative A.

The Alternative C Sites Reservoir Inundation Area and Sites Dams would be the same as the Alternative B reservoir and dams. The Alternative C reservoir and dams would therefore have the same impacts on fish species of primary management concern (**Impact Fish-1**) as described for Alternative B.

The Delevan Pipeline Intake Facilities included in Alternative C would be the same as the Alternative A intake facilities. Therefore, the impacts of the intake facilities on fish species of primary management concern (**Impact Fish-1**) would be the same as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impacts on fish species of primary management concern (**Impact Fish-1**) as described for Alternative A.

12.3.11 Impacts Associated with Alternative C Relative to the No Project/No Action Alternative

Potential impacts on fish species of primary management concern associated with implementation of Alternative C, relative to the No Project/No Action Alternative, were evaluated in an identical manner to those described for the No Project/No Action Alternative, relative to Existing Conditions. Specifically, model results and locations evaluated were identical among alternatives.

A summary of changes in habitat conditions in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs, as well as reservoirs in the export service area under Alternative C, relative to the No Project/No Action Alternative, is presented in Table 12-25. A summary of the changes in habitat conditions associated with riverine, estuarine, and floodplain habitats in the Extended and Secondary study areas under Alternative C, relative to the No Project/No Action Alternative, is presented in Table 12-26. Species-specific summary discussions of the information presented in these tables are provided below to support significance determinations.

12.3.11.1 Extended and Secondary Study Areas - Alternative C Relative to the No Project/No Action Alternative

The impacts associated with Alternative C relative to the No Project/No Action Alternative, as they relate to fish species of primary management concern (**Impact Fish-1**), would be the same as described for Alternative A relative to the No Project/No Action Alternative for the following species within the Extended and Secondary study areas:

- Southern Oregon/Northern California Coho salmon
- Upper Klamath-Trinity River fall-run and spring-run Chinook salmon
- Klamath Mountains Province steelhead
- Sacramento River winter-run Chinook salmon
- Central Valley late fall-run Chinook salmon
- White sturgeon
- Pacific lamprey
- River lamprey
- Hardhead
- California roach
- Delta smelt
- Longfin smelt
- Striped bass
- American shad
- Largemouth bass

Refer to the Alternative B discussion for Central Valley steelhead relative to the No Project/No Action Alternative. That discussion also applies to Central Valley steelhead under Alternative C, relative to the No Project/No Action Alternative.

Detailed discussion of potential impacts and aquatic habitat conditions in the Extended and Secondary study areas is provided in Appendix 12C. Construction-related impacts associated with implementation of Alternative C, relative to the No Project/No Action Alternative, on all species of primary management concern would be the same as those described for Alternative A relative to Existing Conditions. Operational impacts associated with Alternative C relative to the No Project/No Action Alternative that would differ from those described for Alternative A, relative to the No Project/No Action Alternative, are described below.

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use, San Luis Reservoir, Export Service Area Reservoirs, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Spring Creek, Shasta Lake, Sacramento River, Clear Creek, Lake Oroville, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish

nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.

Reservoir Coldwater Fish Species

Reservoir coldwater fish species habitat conditions would be more suitable in Trinity, Shasta, Folsom, and San Luis reservoirs, and similar or more suitable in Oroville Reservoir under Alternative C, relative to the No Project/No Action Alternative. Specifically, within the Secondary Study Area, end-of-month storage generally would be greater under Alternative C, relative to the No Project/No Action Alternative in each of the SWP/CVP reservoirs evaluated. Reservoir coldwater fish species habitat conditions also are anticipated to be more suitable in export service area reservoirs due to generally increased SWP and CVP exports that would occur more frequently and potentially result in increased storage in export service area reservoirs. However, reservoir coldwater fish species habitat in San Luis Reservoir would be less suitable as a result of net storage decreases of 10 percent or more that would occur more often under Alternative C, relative to the No Project/No Action Alternative.

Therefore, for Alternative C, relative to the No Project/No Action Alternative, potential impacts on reservoir coldwater fish species in Oroville Reservoir are considered **less than significant;** impacts on coldwater fish species in Trinity, Shasta, Folsom, and other export service area reservoirs are considered **potentially beneficial;** and impacts on coldwater fish species in San Luis Reservoir are considered **potentially significant**.

Reservoir Warmwater Fish Species

Reservoir warmwater fish species habitat conditions would be similar or more suitable under Alternative C, relative to the No Project/No Action Alternative in Trinity and Shasta reservoirs because water surface elevation reductions of six feet or more during the warmwater fish nesting season would occur less frequently. Therefore, fewer nest dewatering events are anticipated. Water surface elevation reductions of six feet or more would be similar in Oroville and Folsom reservoirs. Therefore, impacts on reservoir warmwater fish species are anticipated to be similar. Reservoir warmwater fish species habitat conditions are anticipated to be more suitable in export service area reservoirs due to generally increased SWP and CVP exports that would occur more frequently and potentially result in increased littoral habitat in export service area reservoirs. However, San Luis Reservoir warmwater fish species habitat would be similar or less suitable due to reservoir water surface elevation reductions of six feet or more that would occur more frequently.

Therefore, for Alternative C, relative to the No Project/No Action Alternative, potential impacts on reservoir warmwater fish species in Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs are considered **less than significant,** and impacts on warmwater fish species in other export service area reservoirs are considered **potentially beneficial**.

Central Valley Spring-Run Chinook Salmon

In general, during periods when spring-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative C, relative to the No Project/No Action Alternative. However, habitat conditions in the Sacramento River and Clear Creek would be similar or more suitable. Specifically, in the Sacramento River, habitat conditions would be generally similar during most life stages, but flows would be higher and water temperatures would be lower more frequently during spawning and embryo incubation. Additionally, these conditions would result in reduced early life stage mortality, reduced population mortality, and increased production potential. Habitat conditions in the American River would be similar or more suitable because higher flows and lower temperatures generally would occur more frequently. Habitat conditions in Clear Creek would be similar or more suitable due to slightly lower water temperatures that would occur more frequently (see Appendix 12C for a detailed discussion).

Overall, under Alternative C, relative to the No Action Alternative, potential operational impacts on spring-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**.

Central Valley Fall-Run Chinook Salmon

In general, during periods when fall-run Chinook salmon are present in the evaluated water bodies, habitat conditions would be similar under Alternative C, relative to the No Project/No Action Alternative. However, simulated habitat conditions in Clear Creek would be similar or more suitable because slightly decreased water temperatures would occur during spawning. Habitat conditions in the American River would be more suitable because of higher flows and lower temperatures that would occur more frequently (see Appendix 12C for a detailed discussion).

Overall, under Alternative C, relative to the No Action Alternative, potential operational impacts on fall-run Chinook salmon in the Sacramento River, Clear Creek, Feather River, Sutter Bypass, Yolo Bypass, Delta, and bays are considered **less than significant**, and impacts on fall-run Chinook salmon in the American River are considered **potentially beneficial**.

Green Sturgeon

In general, during periods when green sturgeon are present in the evaluated water bodies, habitat conditions would be similar under Alternative C, relative to the No Project/No Action Alternative. Additionally, habitat conditions in the Sacramento River would be generally similar or more suitable due to generally similar spawning conditions, but higher flows would occur more often in the lower reaches of the river during adult immigration, and higher flows would occur more often during low flow conditions during juvenile emigration. However, habitat conditions in the Yolo Bypass would be less suitable for juvenile rearing due to a decreased frequency of floodplain activation, which would result in reduced floodplain rearing opportunities and reduced nutrient inflow to the Delta and bays (see Appendix 12C for a detailed discussion).

Overall, under Alternative C, relative to the No Action Alternative, potential operational impacts on green sturgeon in the Trinity River, Sacramento River, Feather River, American River, Sutter Bypass, Delta, and bays are considered **less than significant**, and impacts on green sturgeon in the Yolo Bypass are considered **potentially significant**.

Sacramento Splittail

In general, during periods when splittail are present in the evaluated water bodies, habitat conditions would be similar under Alternative C, relative to the No Project/No Action Alternative. However, reduced flows into and out of the Yolo Bypass would result in less suitable habitat conditions for splittail spawning. Because of the importance of the Yolo Bypass to splittail population abundance, reduced floodplain inundation in the Yolo Bypass would constitute a substantial impact (see Appendix 12C for a detailed discussion).

Overall, under Alternative A, relative to the No Project/No Action Alternative, potential operational impacts on splittail in the Feather River, American River, Sutter Bypass, Delta, and Level 4 wildlife refuges are considered **less than significant**, and impacts on splittail in the Yolo Bypass are considered **potentially significant**.

12.3.11.2 Primary Study Area – Alternative C Relative to the No Project Alternative

Construction, Operation, and Maintenance Impacts

Refer to the **Impact Fish-1** Primary Study Area discussion for Alternative C relative to Existing Conditions. That discussion also applies to Alternative C relative to the No Project/No Action Alternative.

12.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 12-27 for the impacts that have been identified as significant or potentially significant.

Table 12-27
Summary of Mitigation Measures for
NODOS Project Impacts to Aquatic Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Fish-1: A substantial adverse effect (either directly, through habitat modifications, by interfering with the movement of native fish species, or by impeding the use of native fish nursery/rearing sites) on any fish species of primary management concern, including species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG, NMFS or USFWS.				
Impact Fish-1a: Temperature Effects	San Luis Reservoir (Alternative C compared to the No Project/No Action Alternative for coldwater fish species)	Potentially Significant	Mitigation Measure Fish-1a: Increase stocking frequency of coldwater fish species.	Less than Significant
Impact Fish-1b: Reduced Flows	Yolo Bypass (all alternatives)	Potentially Significant	Mitigation Measure Fish-1b: Prepare and Implement a Mitigation Monitoring and Reporting Plan	Less than Significant

Table 12-27
Summary of Mitigation Measures for
NODOS Project Impacts to Aquatic Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Fish-1c: Erosion, Sedimentation and Turbidity	Sites Reservoir Inundation Area, Sites Dams, Road Relocations and South Bridge, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Holthouse Reservoir Complex, GCID Canal Facilities Modifications, TRR to Funks Creek Pipeline, Delevan Pipeline, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility, Project Buffer	Potentially Significant	Mitigation Measure Fish-1c: Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion and Sediment Control Plan (ESCP) prior to the initiation of construction activities.	Less than Significant
Impact Fish-1d: Hazardous Materials and Chemical Spills	Sites Reservoir Inundation Area, Sites Dams, Road Relocations and South Bridge, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Holthouse Reservoir Complex, GCID Canal Facilities Modifications, TRR to Funks Creek Pipeline, Delevan Pipeline, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Fish-1c: Prepare and Implement a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion and Sediment Control Plan (ESCP) Prior to the initiation of Construction Activities.	Less than Significant
			Mitigation Measure Fish-1d: Prepare and Implement a Spill Prevention and Hazardous Materials Management Plan Prior to the Initiation of Construction Activities.	

Table 12-27
Summary of Mitigation Measures for
NODOS Project Impacts to Aquatic Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Fish-1e: Aquatic Habitat Modification	Sites Reservoir Inundation Area, Sites Dams, Sites Reservoir Inlet/Outlet Structure, /Sites Pumping/Generating Plant, Holthouse Reservoir Complex, Delevan Pipeline, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Fish-1e: Implement Habitat Restoration Actions	Less than Significant
Impact Fish-1f: Hydrostatic Pressure Waves, Noise, and Vibration	Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Fish-1f: Perform In-Water Pile Driving July Through September During Daylight Hours.	Less than Significant
Impact Fish-1g: Predation Risk	Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Fish-1g: Design Fish Screen in Compliance with NMFS and CDFG Criteria	Less than Significant
Impact Fish-1h: Stranding, Impingement, and Entrainment	Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Fish-1h: Prepare and Implement a Fish Salvage and Rescue Plan	Less than Significant

Mitigation Measure Fish-1a: Increase stocking frequency of coldwater fish species.

[Text to be developed]

Mitigation Measure Fish-1b: Prepare and Implement a Mitigation Monitoring and Reporting Plan

DWR and Reclamation shall prepare and implement a Mitigation Monitoring and Reporting Plan to mitigate for expected significant reduced flows through the Yolo Bypass (all alternatives), which could include the following mitigation measure:

- Modifications to the Fremont Weir to allow additional flow for inundation of the Yolo Bypass has been identified as a fisheries habitat improvement action by other projects or programs and may be implemented before the NODOS Project is authorized. If modifications occur before implementation of the NODOS Project, this impact would be reduced to less than significant and would not require mitigation. If the modifications are not yet implemented, mitigation measures for the NODOS Project could include modification of the weir to offset potentially reduced flows through the Yolo Bypass and associated habitat availability for splittail and other fish species of primary management concern.

Mitigation Measure Fish-1c: Prepare and Implement a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion and Sediment Control Plan (ESCP) Prior to the Initiation of Construction Activities.

DWR and Reclamation shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion and Sediment Control Plan (ESCP) prior to the initiation of construction activities. The SWPPP and/or ESCP shall incorporate Central Valley Regional Water Quality Control Board's dewatering requirements and the California Storm Water Quality Association's best management practices for dewatering, and shall establish site-specific erosion- and sediment-control measures for construction, operation, and maintenance activities, such as:

- Minimizing traffic speeds on access roads to 10 miles per hour or less.
- Maintaining a minimum of two feet of freeboard on all haul trucks.
- Periodically applying water to disturbed areas, to control dust exposure as needed, depending on weather conditions.
- Applying soil stabilizers in accordance with manufacturers' specifications to all inactive construction areas.
- Installing erosion control wattles around all disturbed areas and ditches.
- Installing silt fencing.
- Utilizing drainage inlet protection.
- Utilizing sediment settling basins through which all water removed from any waterways will be pumped into prior to being discharged into any waterways.
- Utilizing concrete washout areas.
- Hydroseeding and mulching disturbed areas.

Mitigation Measure Fish-1d: Prepare and Implement a Spill Prevention and Hazardous Materials Management Plan Prior to the Initiation of Construction Activities.

DWR and Reclamation shall prepare a Spill Prevention and Hazardous Materials Management Plan (developed as part of the SWPPP) that would be designed to minimize the potential for chemical spills and seepage during construction, operation, and maintenance activities. Such a plan may include, but not be limited to, the following:

- On-site handling rules to keep construction and maintenance materials out of drainages and waterways;
- Prevention of any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, including ditches and canals;
- Cleaning up all spills immediately according to the spill prevention and control plan, and notifying CDFG and the Central Valley Regional Water Quality Control Board (CVRWQCB) immediately of spills and associated cleanup procedures;

- Providing staging and storage areas away from watercourses and their watersheds for equipment, materials, fuels, lubricants, solvents, and other possible contaminants
- Publishing protocols for regular maintenance of construction vehicles and equipment to minimize the potential for leakage or spills.

Mitigation Measure Fish-1e: Implement Habitat Restoration Actions.

To minimize disturbance to aquatic habitat, construction personnel shall participate in an environmental awareness training program provided by a qualified biologist. Construction personnel shall be informed about any sensitive biological resources associated with the proposed Project and that disturbance of sensitive habitat or special-status species would be a violation of the Endangered Species Act and the Clean Water Act.

Mitigation specific to construction of the proposed Project facilities could include the following:

- **Construction of Sites Reservoir Inundation Area and Sites Dams**
  - Mitigation measures to offset inundation of Stone Corral and Funks creeks shall include habitat restoration of Stone Corral and Funks Creek at a ratio of 2:1 (i.e., two acres restored for every acre removed), such that twice as many linear stream miles would be restored along Stone Corral and Funks creeks as would be inundated by Sites Reservoir and displaced by Sites and Golden Gate dams. Habitat restoration actions may occur at other nearby creeks if feasible habitat restoration actions on Stone Corral and Funks creek are inadequate to meet mitigation requirements. Habitat restoration measures could include removal of non-native vegetation in the riparian area, planting of native riparian species, bank stabilization in areas with excessive erosion, and potentially active removal of non-native fish species. Monitoring of restoration actions shall be conducted for a minimum of five years to ensure that restored habitat is functioning as intended. Specific restoration actions and sites to be restored at each creek shall be included in the Mitigation Monitoring and Reporting Plan.
- **Construction of Holthouse Reservoir Complex, the Sites Reservoir Inlet/Outlet Structure, and the Sites Pumping/Generating Plant**
  - Mitigation measures shall include habitat restoration along Funks Creek at a ratio of 2:1, which shall be in addition to the number of stream miles restored associated with inundation of Funks Creek by Sites Reservoir. Habitat restoration actions may occur at other nearby creeks if feasible habitat restoration actions on Funks creek are inadequate to meet mitigation requirements. Monitoring of restoration actions shall be conducted for a minimum of five years to ensure that restored habitat is functioning as intended. Specific restoration actions and sites to be restored shall be included in the Mitigation Monitoring and Reporting Plan.
- **Construction of the Delevan Pipeline**
  - Construction activities associated with the Delevan Pipeline at Hunters Creek and the Colusa Basin Drain shall occur during the summer months when the water bodies generally are dry. If construction occurs during a particularly wet year when the water bodies do not cease flowing, construction shall occur in a manner that allows passage of native fishes past construction sites. Specifically, construction shall occur across only half of the water body at one time. Cofferdams shall be installed to isolate half of the total construction area, allowing the other half of the water body to remain flowing. After construction on one side of the water body is complete, the other half shall then be isolated and dewatered where construction shall continue.

- Measures to mitigate for the temporary loss of habitat on Hunters Creek and the Colusa Basin Drain shall include on-site habitat restoration following the completion of construction. Habitat restoration measures could include planting of native riparian species and removal of non-native vegetation. Monitoring of restoration actions shall be conducted for a minimum of five years to ensure that restored habitat is functioning as intended.

- **Construction of the Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility**
  - As mitigation for loss of riparian and SRA habitat on the Sacramento River, degraded habitat shall be restored to provide riparian and/or SRA habitat at or near the areas affected by construction of the intake/discharge facilities at a ratio of 2:1. Proposed restoration activities shall include the removal of non-native vegetation as necessary and re-vegetation with native riparian species to provide shaded riverine aquatic (SRA) and/or riparian habitat. As a component of SRA habitat, riparian tree species such as alders, cottonwoods and willows, shall be planted. In addition to habitat restoration actions, due to the importance of IWM to juvenile fishes in the Sacramento River, any IWM that is moved or altered by construction activities shall stay on-site and be returned to the river, or be replaced with a functional equivalent. Monitoring of restoration actions shall be conducted for a minimum of five years to ensure that restored habitat is functioning as intended. Specific restoration actions and sites to be restored on the Sacramento River shall be included in the Mitigation Monitoring and Reporting Plan.

Mitigation Measure Fish-1f: Perform In-Water Pile Driving July Through September During Daylight Hours.

In-water pile driving shall only occur during July through September during daylight hours. This time period takes into consideration the migratory patterns of salmonids; pile driving shall occur after the cessation of the outmigration of juvenile salmon and before the initiation of the upstream migration of adults returning to spawn. To avoid impacts to the majority of fish species of primary management concern, sheet pile installation and in-stream heavy equipment activity shall be coordinated with USFWS, USBR, CDFG, and NMFS to avoid and or minimize potential impacts. If feasible, a vibratory hammer shall be used, and pile driving shall commence at low energy levels and slowly build to impact force. In addition, underwater sound levels shall be monitored to ensure that pile driving activities do not create underwater sound levels that exceed NMFS’ noise thresholds (i.e., accumulated sound exposure level of 183 dB and a peak pressure of 206 dB).

Mitigation Measure Fish-1g: Design Fish Screen in Compliance with NMFS and CDFG Criteria.

Fish screen at the Delevan Pipeline Intake Facilities shall be designed to comply with NMFS and CDFG fish screening criteria. The Delevan Pipeline Intake Facilities or Discharge Facility shall be designed to minimize hydraulic and physical habitat that is suitable for non-native predatory fish species. The facility shall be designed in coordination with NMFS and CDFG to ensure incorporation of the best available scientific and engineering knowledge of fish screen design to minimize predation potential on fish species of primary management concern. These design criteria shall minimize or avoid increased habitat suitability for non-native predatory fish species. However, a monitoring and adaptive management program shall be implemented to ensure that losses resulting from predatory fish are minimized.

Mitigation Measure Fish-1h: Prepare and Implement a Fish Salvage and Rescue Plan.

The fish screen at the Delevan Pipeline Intake Facilities shall be designed to comply with NMFS and CDFG fish screening criteria. In addition, a Fish Salvage and Rescue Plan shall be developed and approved by NMFS and CDFG prior to initiation of construction activities, and could include the following measure:

- A qualified biologist shall provide construction monitoring throughout all phases of the project. If spawning activities for sensitive fish species are encountered during construction activities, the monitoring biologist shall be authorized to stop construction activities until appropriate corrective measures are completed or it is determined that the fish would not be harmed. If possible, all fish species shall be allowed to independently move away from the area. Fish that become entrapped in any side channel where construction work is taking place shall be netted, transported to the river, and released according to the Fish Salvage and Release Plan.

Implementation of **Mitigation Measures Fish-1a, Fish-1b, Fish-1c, Fish-1d, Fish-1e, Fish-1f, Fish-1g, and Fish-1f** would reduce the level of significance of Project impacts to aquatic biological resources to **less than significant**.

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Tables

Table 12-13

Summary of Potential Impacts: No Project/No Action Alternative Compared to Existing Conditions for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS COMPARISON: NO PROJECT/ NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
OPERATIONS IMPACTS		
Extended Study Area		
San Luis Reservoir	SIMILAR	SIMILAR
Export Service Area Reservoirs	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE
Secondary Study Area		
Trinity Lake	SIMILAR / MORE SUITABLE	SIMILAR
Shasta Lake	SIMILAR	SIMILAR
Lake Oroville	SIMILAR / LESS SUITABLE	SIMILAR
Folsom Lake	SIMILAR / LESS SUITABLE	SIMILAR

SIMILAR / MORE SUITABLE (blue symbol) SIMILAR (open circle)
SIMILAR / LESS SUITABLE (red symbol)

Table 12-14
Summary of Potential Impacts: No Project/No Action Alternative Compared to Existing Conditions for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.

NODOS FISHERIES SYNTHESIS

COMPARISON: NO PROJECT/ NO ACTION ALTERNATIVE RELATIVE TO EXISTING CONDITIONS

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														SIMILAR			SIMILAR			
Secondary Study Area																				
Trinity River	SIMILAR	SIMILAR	SIMILAR						SIMILAR	SIMILAR	SIMILAR									
Sacramento River				SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR				SIMILAR	SIMILAR	SIMILAR
Clear Creek					SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE			SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE						
Feather River					SIMILAR	SIMILAR		SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR	SIMILAR	SIMILAR	SIMILAR
American River					SIMILAR	LESS SUITABLE		LESS SUITABLE	LESS SUITABLE		LESS SUITABLE	LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE			LESS SUITABLE	LESS SUITABLE	LESS SUITABLE	SIMILAR
Sutter Bypass				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR							SIMILAR			
Yolo Bypass				•	•	•	•	SIMILAR	SIMILAR	SIMILAR							SIMILAR			SIMILAR
Delta				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR
Bays+				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR	SIMILAR		SIMILAR	SIMILAR	
Primary Study Area																				
Funks & Stone Corral Creeks														SIMILAR						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.
+ Includes Suisun, San Pablo, and San Francisco Bays

SIMILAR / MORE SUITABLE | SIMILAR | SIMILAR / LESS SUITABLE | LESS SUITABLE

Table 12-15

Summary of Potential Impacts: Alternative A Compared to Existing Conditions for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE A RELATIVE TO EXISTING CONDITIONS

	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
OPERATIONS IMPACTS		
Extended Study Area		
San Luis Reservoir	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE
Export Service Area Reservoirs	MORE SUITABLE	MORE SUITABLE
Secondary Study Area		
Trinity Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Shasta Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Lake Oroville	SIMILAR	SIMILAR
Folsom Lake	MORE SUITABLE	SIMILAR / LESS SUITABLE

SIMILAR / MORE SUITABLE
MORE SUITABLE
SIMILAR / LESS SUITABLE
SIMILAR

Table 12-16
Summary of Potential Impacts: Alternative A Compared to Existing Conditions for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE A RELATIVE TO EXISTING CONDITIONS

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														SIMILAR			SIMILAR			
Secondary Study Area																				
Trinity River	SIMILAR	SIMILAR / MORE SUITABLE	SIMILAR						SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR									
Sacramento River				MORE SUITABLE	MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR	SIMILAR / MORE SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR	SIMILAR	SIMILAR				SIMILAR	SIMILAR	SIMILAR
Clear Creek					SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE			SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE						
Feather River					SIMILAR / MORE SUITABLE	SIMILAR		SIMILAR	SIMILAR	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR			SIMILAR	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR
American River					SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE		SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE		SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR			SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR
Sutter Bypass				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR							SIMILAR			
Yolo Bypass				•	•	•	•	LESS SUITABLE	LESS SUITABLE	LESS SUITABLE							LESS SUITABLE			LESS SUITABLE
Delta				SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR	SIMILAR	SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR	SIMILAR / LESS SUITABLE
Bays+				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR	SIMILAR		SIMILAR	SIMILAR	
Primary Study Area																				
Funks & Stone Corral Creeks														SIMILAR						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.
+ Includes Suisun, San Pablo, and San Francisco Bays

MORE SUITABLE | SIMILAR / MORE SUITABLE | SIMILAR | SIMILAR / LESS SUITABLE | LESS SUITABLE

Table 12-17

Summary of Potential Impacts: Alternative A Compared to the No Project/No Action Alternative for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE A RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE

OPERATIONS IMPACTS	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
Extended Study Area		
San Luis Reservoir	Similar	Similar / Less Suitable
Export Service Area Reservoirs	Similar / More Suitable	Similar / More Suitable
Secondary Study Area		
Trinity Lake	More Suitable	Similar / More Suitable
Shasta Lake	More Suitable	Similar / More Suitable
Lake Oroville	More Suitable	Similar
Folsom Lake	More Suitable	Similar

SIMILAR / MORE SUITABLE
MORE SUITABLE
SIMILAR / LESS SUITABLE
SIMILAR

Table 12-18
Summary of Potential Impacts: Alternative A Compared to the No Project/No Action Alternative for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE A RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														Similar			Similar			
Secondary Study Area																				
Trinity River	Similar / More Suitable	Similar / More Suitable	Similar						Similar / More Suitable	Similar	Similar									
Sacramento River				More Suitable	More Suitable	Similar	Similar	Similar	Similar / More Suitable	Similar	Similar	Similar	Similar	Similar				Similar	Similar	Similar
Clear Creek					Similar / More Suitable	Similar / More Suitable	Similar	Similar			Similar	Similar	Similar	Similar						
Feather River					Similar	Similar		Similar	Similar	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar			Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar
American River					Similar	Similar / More Suitable		Similar	Similar / More Suitable		More Suitable	More Suitable	Similar / More Suitable	Similar / More Suitable			Similar / More Suitable	More Suitable	More Suitable	Similar
Sutter Bypass				Similar	Similar	Similar	Similar	Similar	Similar	Similar							Similar			
Yolo Bypass				•	•	•	•	Less Suitable	Less Suitable	Less Suitable							Less Suitable			Less Suitable
Delta				Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar			Similar / More Suitable	Similar	Similar / Less Suitable	Similar	Similar	Similar
Bays+				Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar			Similar / More Suitable	Similar		Similar	Similar	
Primary Study Area																				
Funks & Stone Corral Creeks														Similar						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.

+ Includes Suisun, San Pablo, and San Francisco Bays

MORE SUITABLE | SIMILAR / MORE SUITABLE | SIMILAR | SIMILAR / LESS SUITABLE | LESS SUITABLE

Table 12-19

Summary of Potential Impacts: Alternative B Compared to Existing Conditions for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE B RELATIVE TO EXISTING CONDITIONS

OPERATIONS IMPACTS	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
Extended Study Area		
San Luis Reservoir	Similar / Less Suitable	Similar / Less Suitable
Export Service Area Reservoirs	More Suitable	More Suitable
Secondary Study Area		
Trinity Lake	More Suitable	Similar / More Suitable
Shasta Lake	More Suitable	Similar / More Suitable
Lake Oroville	Similar / More Suitable	Similar
Folsom Lake	Similar	Similar

SIMILAR / MORE SUITABLE — MORE SUITABLE
SIMILAR / LESS SUITABLE — SIMILAR

Table 12-20
Summary of Potential Impacts: Alternative B Compared to the Existing Conditions for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

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NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE B RELATIVE TO EXISTING CONDITIONS

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														Similar			Similar			
Secondary Study Area																				
Trinity River	Similar	Similar / More Suitable	Similar						Similar	Similar	Similar									
Sacramento River				More Suitable	More Suitable	Similar	Similar	Similar	Similar / More Suitable	Similar / Less Suitable	Similar	Similar	Similar	Similar				Similar	Similar	Similar
Clear Creek					Similar / More Suitable	Similar / More Suitable	Similar / More Suitable	Similar / More Suitable			Similar / More Suitable	Similar / More Suitable	Similar / More Suitable	Similar / More Suitable						
Feather River					Similar / More Suitable	Similar		Similar	Similar	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable			Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar
American River					Similar / Less Suitable	Similar / Less Suitable		Similar / Less Suitable	Similar / Less Suitable		Similar / Less Suitable	Similar / Less Suitable	Similar	Similar			Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar
Sutter Bypass				Similar	Similar	Similar	Similar	Similar	Similar	Similar							Similar			
Yolo Bypass				•	•	•	•	Less Suitable	Less Suitable	Less Suitable							Less Suitable			Less Suitable
Delta				Similar / More Suitable	Similar / More Suitable	Similar / More Suitable	Similar / More Suitable	Similar	Similar	Similar	Similar	Similar			Similar	Similar	Similar / Less Suitable	Similar	Similar	Similar
Bays+				Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar			Similar	Similar		Similar	Similar	
Primary Study Area																				
Funks & Stone Corral Creeks														Similar						

MORE SUITABLE — SIMILAR / MORE SUITABLE — SIMILAR — SIMILAR / LESS SUITABLE — LESS SUITABLE

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.

+ Includes Suisun, San Pablo, and San Francisco Bays

Table 12-21

Summary of Potential Impacts: Alternative B Compared to the No Project/No Action Alternative for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS COMPARISON: ALTERNATIVE B RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
OPERATIONS IMPACTS		
Extended Study Area		
San Luis Reservoir	MORE SUITABLE	SIMILAR
Export Service Area Reservoirs	MORE SUITABLE	MORE SUITABLE
Secondary Study Area		
Trinity Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Shasta Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Lake Oroville	MORE SUITABLE	SIMILAR
Folsom Lake	MORE SUITABLE	SIMILAR

SIMILAR / MORE SUITABLE
MORE SUITABLE
SIMILAR

Table 12-22
Summary of Potential Impacts: Alternative B Compared to the No Project/No Action Alternative
for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

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NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE B RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														SIMILAR			SIMILAR			
Secondary Study Area																				
Trinity River	SIMILAR	SIMILAR	SIMILAR						SIMILAR	SIMILAR	SIMILAR									
Sacramento River				MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR	SIMILAR	SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR				SIMILAR	SIMILAR	SIMILAR
Clear Creek					SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR			SIMILAR	SIMILAR	SIMILAR	SIMILAR						
Feather River					SIMILAR	SIMILAR		SIMILAR	SIMILAR	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR / LESS SUITABLE	SIMILAR			SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR	SIMILAR
American River					SIMILAR	SIMILAR / MORE SUITABLE		SIMILAR / MORE SUITABLE	SIMILAR		SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE			SIMILAR	SIMILAR / MORE SUITABLE	SIMILAR / MORE SUITABLE	SIMILAR
Sutter Bypass				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR							SIMILAR			
Yolo Bypass				•	•	•	•	LESS SUITABLE	LESS SUITABLE	LESS SUITABLE							LESS SUITABLE			LESS SUITABLE
Delta				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR / MORE SUITABLE	SIMILAR	SIMILAR / LESS SUITABLE	SIMILAR	SIMILAR	SIMILAR
Bays+				SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR	SIMILAR			SIMILAR / MORE SUITABLE	SIMILAR		SIMILAR	SIMILAR	
Primary Study Area																				
Funks & Stone Corral Creeks														SIMILAR						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.
+ Includes Suisun, San Pablo, and San Francisco Bays

MORE SUITABLE SIMILAR / MORE SUITABLE SIMILAR SIMILAR / LESS SUITABLE LESS SUITABLE

Table 12-23

Summary of Potential Impacts: Alternative C Compared to Existing Conditions for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS COMPARISON: ALTERNATIVE C RELATIVE TO EXISTING CONDITIONS	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
OPERATIONS IMPACTS		
Extended Study Area		
San Luis Reservoir	Similar / Less Suitable	Similar / Less Suitable
Export Service Area Reservoirs	More Suitable	More Suitable
Secondary Study Area		
Trinity Lake	More Suitable	Similar / More Suitable
Shasta Lake	More Suitable	More Suitable
Lake Oroville	Similar	Similar
Folsom Lake	Similar / More Suitable	Similar / Less Suitable

SIMILAR / MORE SUITABLE · MORE SUITABLE · SIMILAR / LESS SUITABLE · SIMILAR

Table 12-24
Summary of Potential Impacts: Alternative C Compared to Existing Conditions for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE C RELATIVE TO EXISTING CONDITIONS

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS																				
Extended Study Area																				
Wildlife Refuges														Similar			Similar			
Secondary Study Area																				
Trinity River	Similar	Similar / more suitable	Similar						Similar / more suitable	Similar	Similar									
Sacramento River				More suitable	Similar / more suitable	Similar	Similar	Similar	Similar / more suitable	Similar / less suitable	Similar	Similar	Similar	Similar				Similar	Similar	Similar
Clear Creek					Similar / more suitable	Similar / more suitable	Similar / more suitable	Similar / more suitable			Similar / more suitable	Similar / more suitable	Similar / more suitable	Similar / more suitable						
Feather River					Similar / more suitable	Similar		Similar	Similar	Similar / less suitable	Similar / less suitable	Similar / less suitable	Similar / less suitable	Similar			Similar / less suitable	Similar / less suitable	Similar / less suitable	Similar
American River					Similar / less suitable	Similar / less suitable		Similar / less suitable	Similar / less suitable		Similar / less suitable	Similar / less suitable	Similar	Similar			Similar / less suitable	Similar / less suitable	Similar / less suitable	Similar
Sutter Bypass				Similar	Similar	Similar	Similar	Similar	Similar	Similar							Similar			
Yolo Bypass				•	•	•	•	Less suitable	Less suitable	Less suitable							Less suitable			Less suitable
Delta				Similar	Similar	Similar / more suitable	Similar / more suitable	Similar	Similar	Similar	Similar	Similar			Similar	Similar	Similar / less suitable	Similar	Similar	Similar / less suitable
Bays+				Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar			Similar	Similar		Similar	Similar	
Primary Study Area																				
Funks & Stone Corral Creeks														Similar						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.
+ Includes Suisun, San Pablo, and San Francisco Bays

MORE SUITABLE | SIMILAR / MORE SUITABLE | SIMILAR | SIMILAR / LESS SUITABLE | LESS SUITABLE

Table 12-25

Summary of Potential Impacts: Alternative C Compared to the No Project/No Action Alternative for Fish Species of Primary Management Concern that use Reservoir Habitat

NODOS FISHERIES SYNTHESIS COMPARISON: ALTERNATIVE C RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE	Reservoir Coldwater FISH SPECIES	Reservoir Warmwater FISH SPECIES
OPERATIONS IMPACTS		
Extended Study Area		
San Luis Reservoir	LESS SUITABLE	SIMILAR / LESS SUITABLE
Export Service Area Reservoirs	MORE SUITABLE	MORE SUITABLE
Secondary Study Area		
Trinity Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Shasta Lake	MORE SUITABLE	SIMILAR / MORE SUITABLE
Lake Oroville	SIMILAR / MORE SUITABLE	SIMILAR
Folsom Lake	MORE SUITABLE	SIMILAR

SIMILAR / MORE SUITABLE
MORE SUITABLE
SIMILAR / LESS SUITABLE
SIMILAR
LESS SUITABLE

Table 12-26
Summary of Potential Impacts: Alternative C Compared to the No Project/No Action Alternative for Fish Species of Primary Management Concern that use Riverine, Estuarine, and Floodplain Habitats

NODOS FISHERIES SYNTHESIS

COMPARISON: ALTERNATIVE C RELATIVE TO THE NO PROJECT/ NO ACTION ALTERNATIVE

	Coho Salmon SOUTHERN OREGON / NORTHERN CALIFORNIA	Chinook Salmon UPPER KLAMATH - TRINITY	Steelhead KLAMATH MOUNTAINS PROVINCE	Chinook Salmon SACRAMENTO RIVER WINTER-RUN	Chinook Salmon CENTRAL VALLEY SPRING-RUN	Chinook Salmon CENTRAL VALLEY FALL-RUN	Chinook Salmon CENTRAL VALLEY LATE FALL-RUN	Steelhead CENTRAL VALLEY	Green Sturgeon	White Sturgeon
OPERATIONS IMPACTS										
Extended Study Area										
Wildlife Refuges										
Secondary Study Area										
Trinity River	Similar / More Suitable	Similar / More Suitable	Similar						Similar	Similar
Sacramento River				More Suitable	Similar / More Suitable	Similar	Similar	Similar	Similar / More Suitable	Similar
Clear Creek					Similar / More Suitable	Similar / More Suitable	Similar	Similar		
Feather River					Similar	Similar		Similar	Similar	Similar / Less Suitable
American River					Similar / More Suitable	More Suitable		Similar / More Suitable	Similar / More Suitable	
Sutter Bypass				Similar	Similar	Similar	Similar	Similar	Similar	Similar
Yolo Bypass				•	•	•	•	Less Suitable	Less Suitable	Less Suitable
Delta				Similar	Similar	Similar	Similar	Similar	Similar	Similar
Bays+				Similar	Similar	Similar	Similar	Similar	Similar	Similar
Primary Study Area										
Funks & Stone Corral Creeks										

	Pacific Lamprey	River Lamprey	Hardhead	Roach	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	American Shad	Largemouth Bass
OPERATIONS IMPACTS										
Extended Study Area										
Wildlife Refuges				Similar			Similar			
Secondary Study Area										
Trinity River	Similar									
Sacramento River	Similar	Similar	Similar	Similar				Similar	Similar	Similar
Clear Creek	Similar	Similar	Similar	Similar						
Feather River	Similar / Less Suitable	Similar / Less Suitable	Similar / Less Suitable	Similar			Similar	Similar / Less Suitable	Similar / Less Suitable	Similar
American River	More Suitable	More Suitable	Similar / More Suitable	Similar / More Suitable			Similar	Similar / More Suitable	Similar / More Suitable	Similar
Sutter Bypass							Similar			
Yolo Bypass							Less Suitable			Less Suitable
Delta	Similar	Similar			Similar / More Suitable	Similar	Similar / Less Suitable	Similar	Similar	Similar
Bays+	Similar	Similar			Similar / More Suitable	Similar		Similar	Similar	
Primary Study Area										
Funks & Stone Corral Creeks				Similar						

• Changes in juvenile Chinook salmon survival through the Delta (including the Yolo Bypass) are simulated in the Delta Passage Model, and are included within the Delta evaluation.
+ Includes Suisun, San Pablo, and San Francisco Bays

MORE SUITABLE · SIMILAR / MORE SUITABLE · SIMILAR · SIMILAR / LESS SUITABLE · LESS SUITABLE

Figures

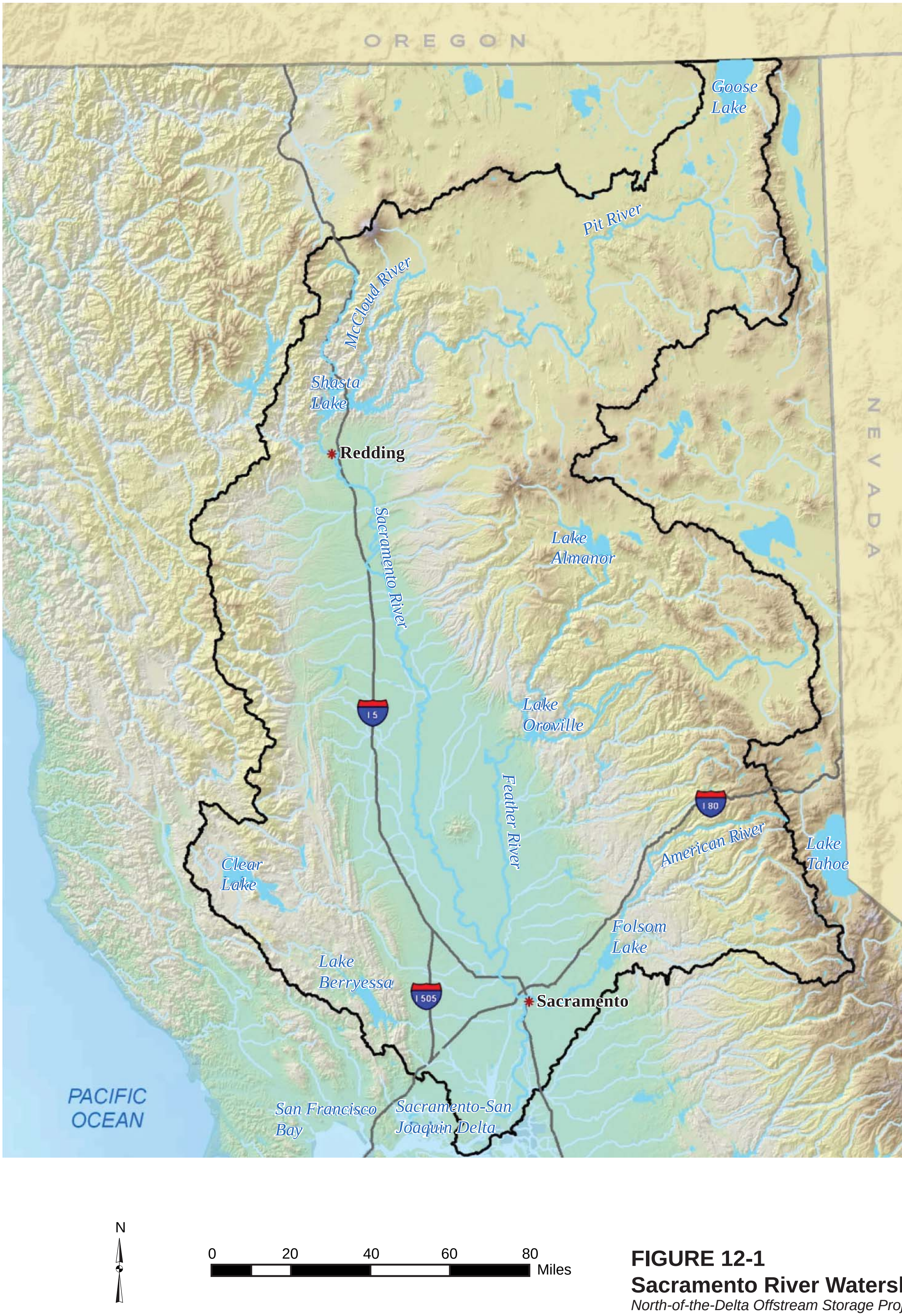
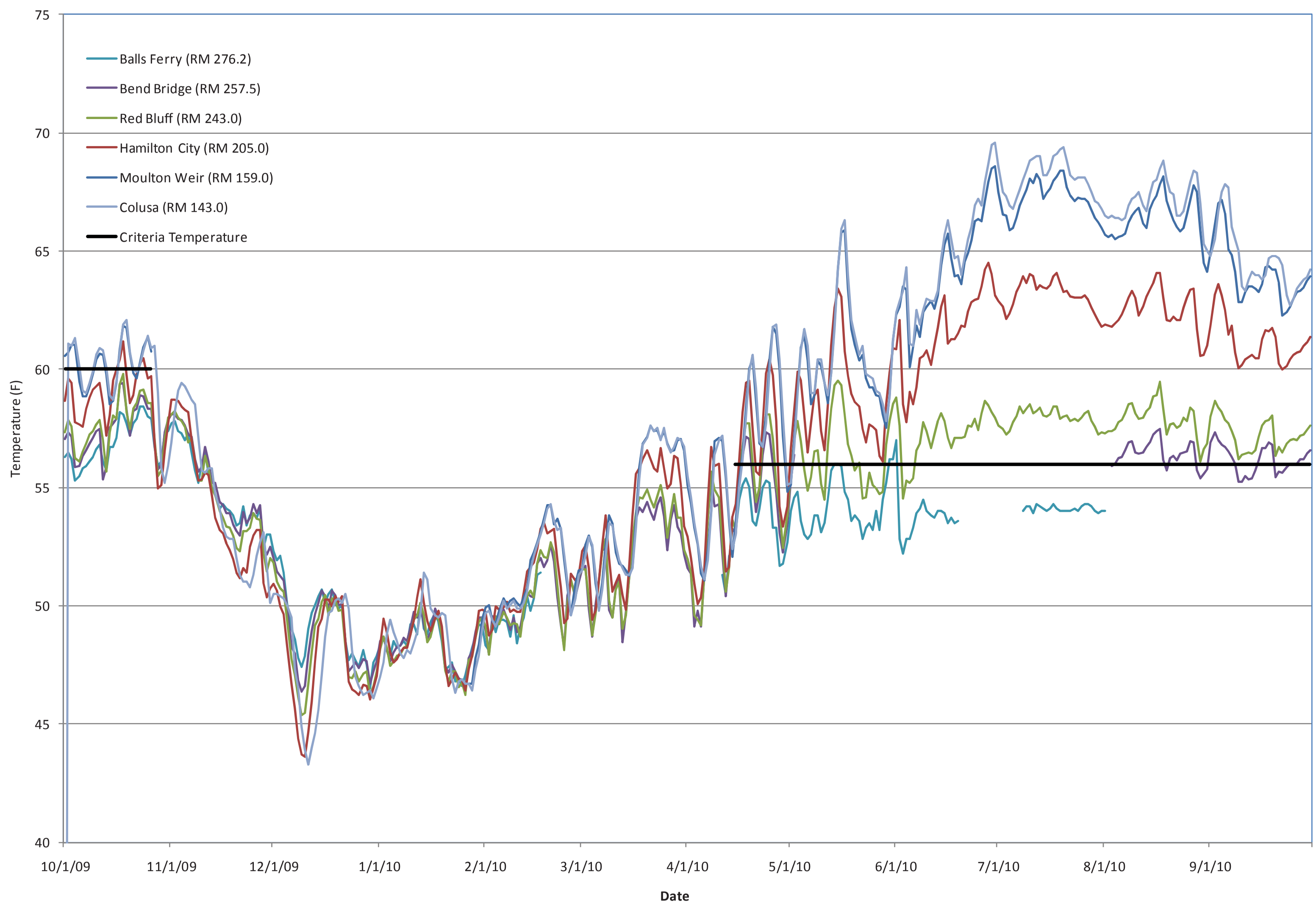


FIGURE 12-1
Sacramento River Watershed
North-of-the-Delta Offstream Storage Project



Note: RM - River Mile

FIGURE 12-2
Average Daily Water Temperatures for the Sacramento River from Balls Ferry (RM 276) to Colusa (RM 143) during Water Year 2010
North-of-the-Delta Offstream Storage Project

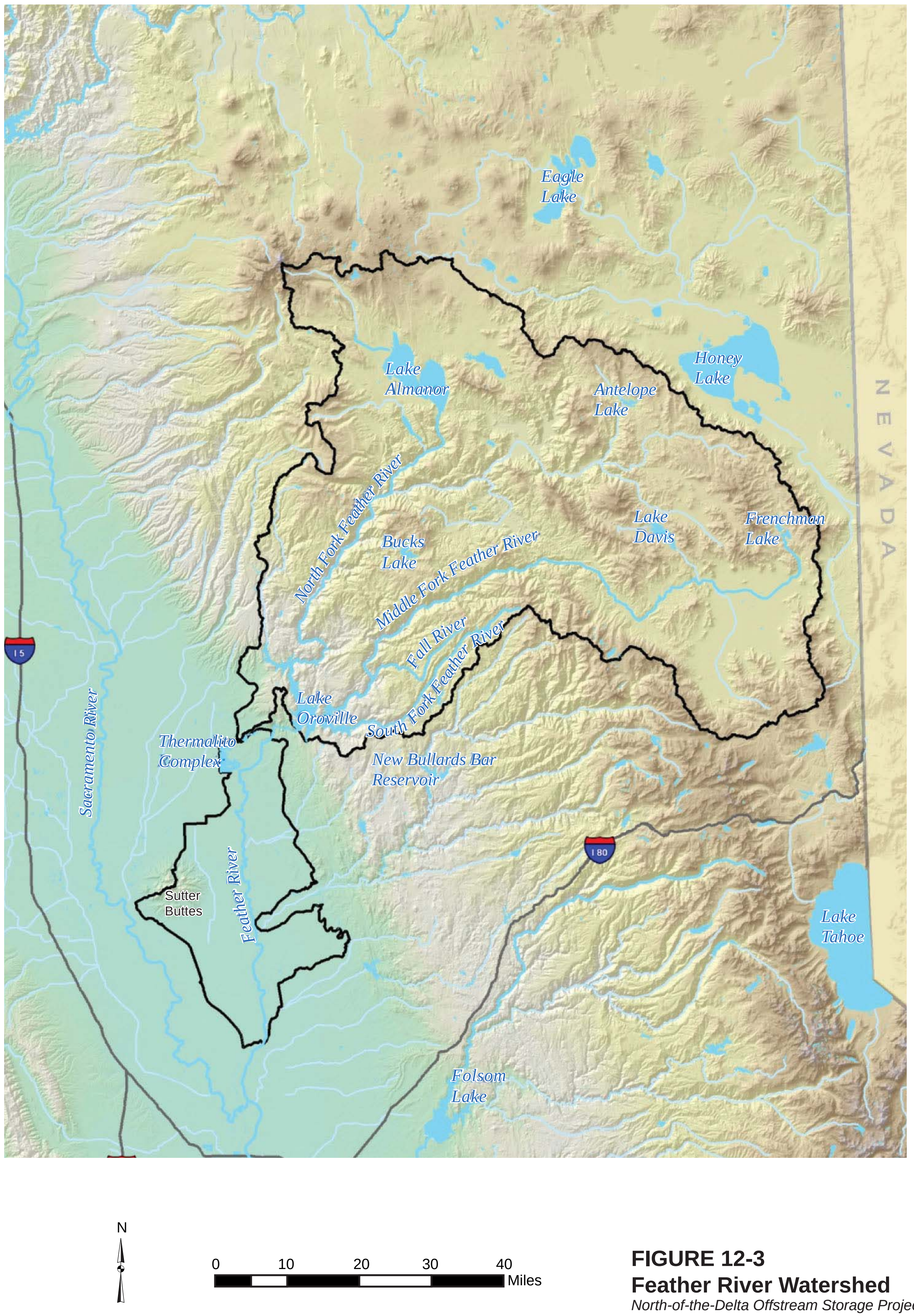


FIGURE 12-3
Feather River Watershed
North-of-the-Delta Offstream Storage Project

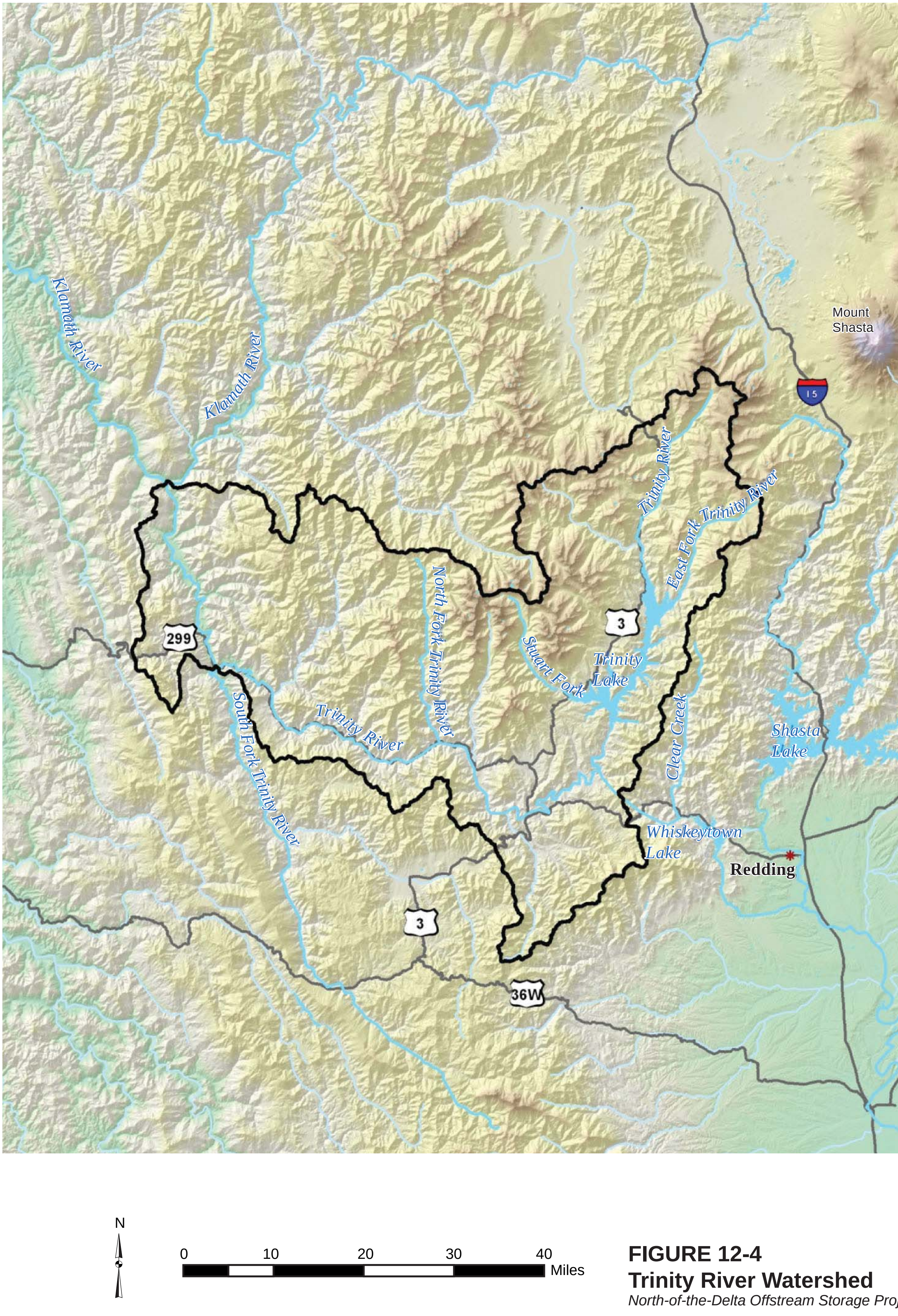


FIGURE 12-4
Trinity River Watershed
North-of-the-Delta Offstream Storage Project

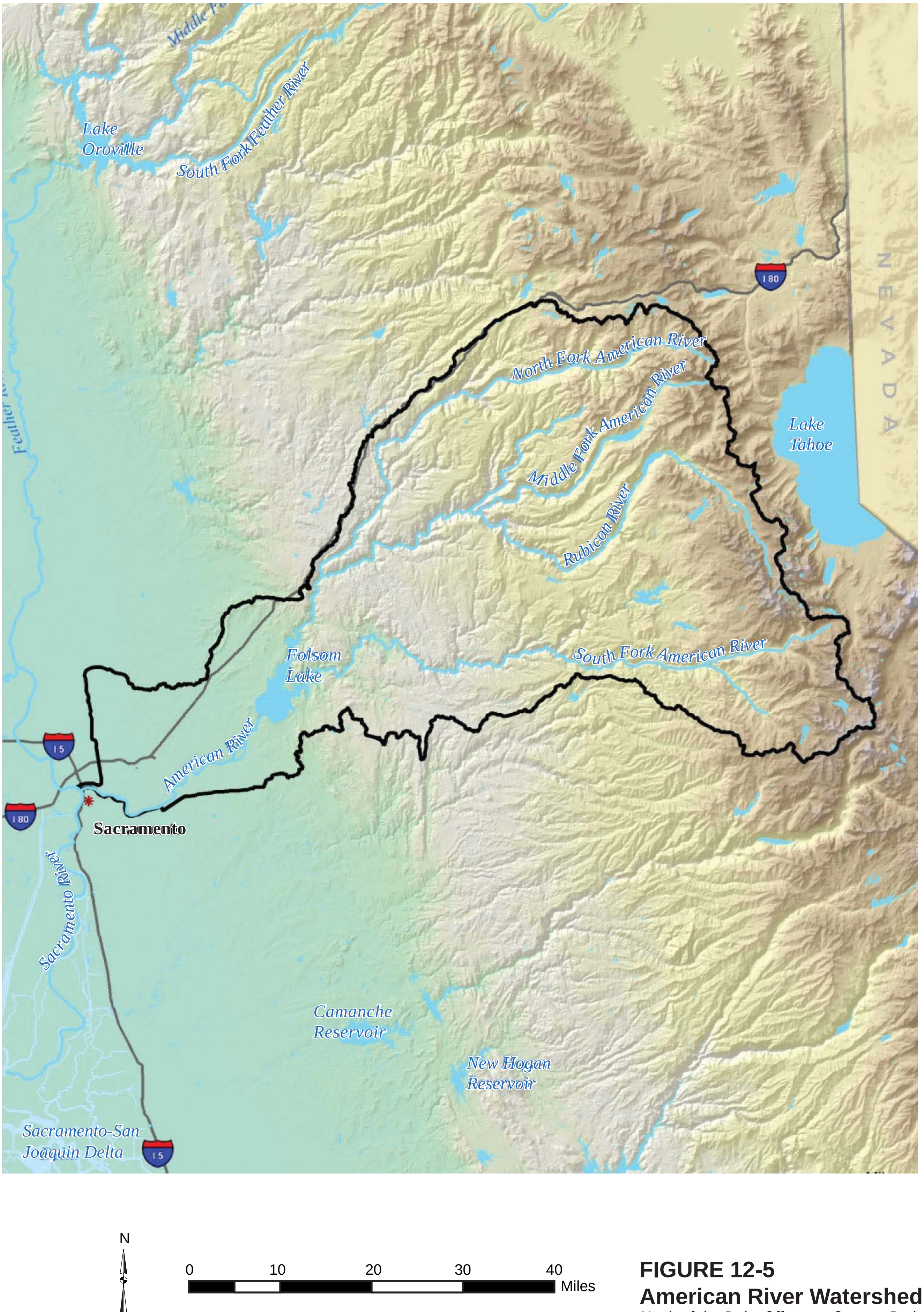


FIGURE 12-5
American River Watershed
North-of-the-Delta Offstream Storage Project

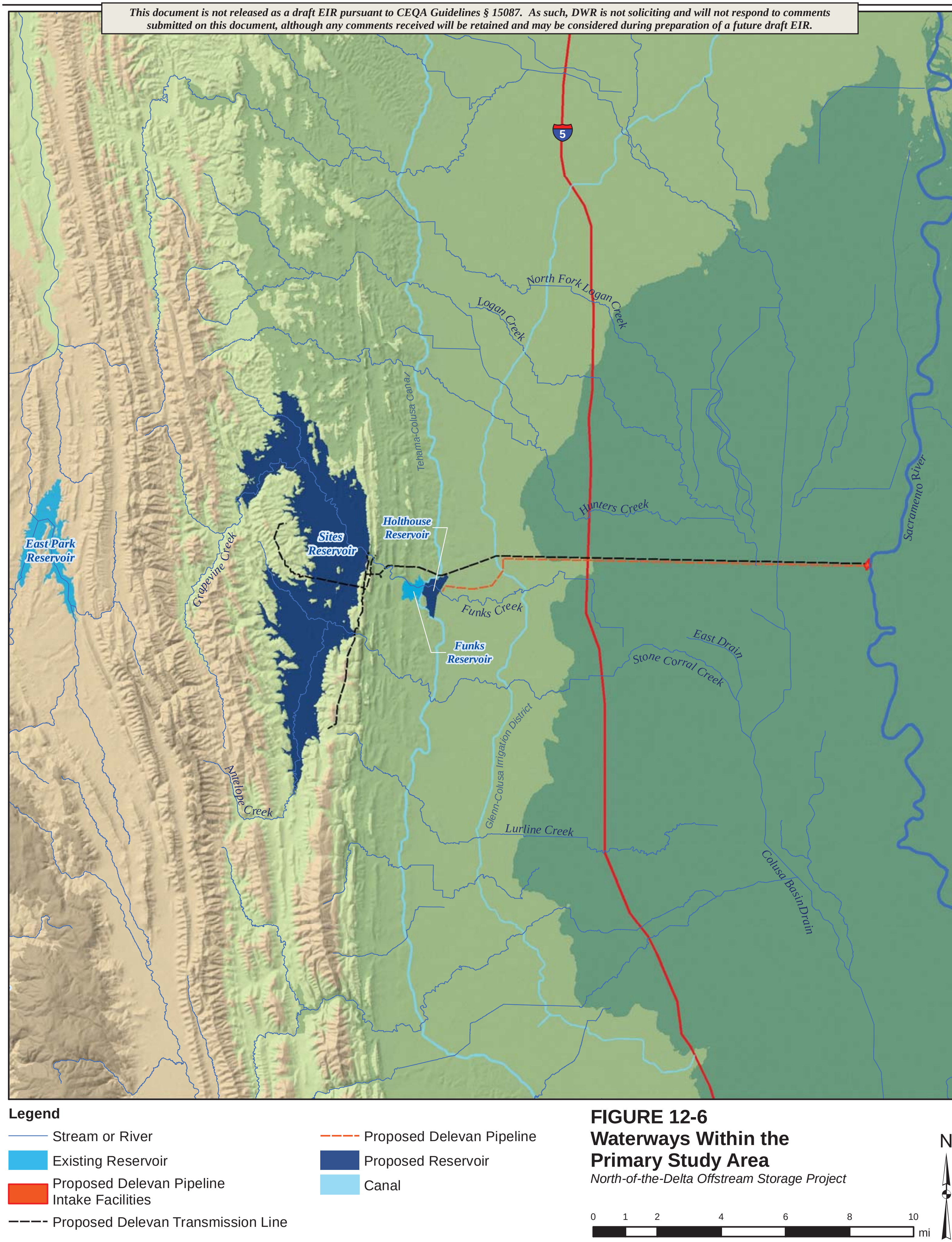


FIGURE 12-6
Waterways Within the Primary Study Area
North-of-the-Delta Offstream Storage Project

Path: W:\NODOS\MapFiles\Chapters\Fisheries\Figure12-6_Waterways_New.mxd

Stone Corral Creek within the Proposed Sites Reservoir Footprint in the Town of Sites (2/23/2011)

Stone Corral Creek Immediately Downstream of the Proposed Sites Dam Location (2/23/2011)

FIGURE 12-7
Proposed Project Facility Locations
North-of-the-Delta Offstream Storage Project

Stone Corral Creek Immediately Downstream of the Proposed Sites Dam Location (Looking Upstream) (2/23/2011)

Portion of Funks Creek that would be Inundated by the Proposed Holthouse Reservoir (Looking Downstream from Funks Dam) (2/23/2011)

FIGURE 12-8
Proposed Project Facility Locations
North-of-the-Delta Offstream Storage Project

Portion of Funks Creek that would be Inundated by the Proposed Holthouse Reservoir (Looking Downstream from Funks Dam) (2/23/2011)

Location of the Proposed Delevan Pipeline Intake Facilities on the Sacramento River (Looking Downstream from the Existing Maxwell Irrigation District Intake) (2/23/2011)

FIGURE 12-9
Proposed Project Facility Locations
North-of-the-Delta Offstream Storage Project

Location of the Proposed Delevan Pipeline Intake Facilities on the Sacramento River (Looking Downstream from the Existing Maxwell Irrigation District Intake) (2/23/2011)

FIGURE 12-10
Proposed Project Facility Locations
North-of-the-Delta Offstream Storage Project

13. Botanical Resources

13.1 Introduction

This chapter describes the botanical resources setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Botanical resources include vegetation communities, non-native invasive weed species, and special-status plant species.

The regulatory setting for botanical resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

13.2 Environmental Setting/Affected Environment

13.2.1 Extended Study Area

13.2.1.1 Methodology

Vegetation Communities

Vegetation communities are broad categories that represent an assemblage of similar native vegetation associations that are typically defined by dominant or co-dominant species. Vegetation communities, as used in this section, are based on the broader and more general vegetation categories, sometimes referred to as “series” (Sawyer and Keeler-Wolf, 1995) or, more recently “alliance” or even more generally “group” (Sawyer et al., 2009).

No vegetation community type (alliance, group) for urban or agricultural land is designated in the above sources. Likewise, DFG’s Wildlife Habitat Relationships (WHR) System (DFG, 2008) urban and agricultural types do not have any corresponding vegetation communities in the National Vegetation Classification System (NVCS); these land cover types “do not meet the criteria for any wildland (native) habitat” (DFG, 2007). Because none of the categories of native plant communities normally used for California vegetation apply in this case, no native vegetation types are discussed for the urban or agricultural lands in the Extended Study Area.

The specified wildlife refuges contain perennial marsh native plant communities. The community name for perennial marshes (“temperate and subpolar grasslands”) found in Sawyer et al., (2009), Appendix 3 (National Vegetation Classification Hierarchy – groups and macrogroups) conveys little information. In the Manual of California Vegetation, perennial freshwater marsh is a collection of over 20 alliances, ranging from the Common Rush Riparian Grassland alliance to Bulrush-Cattail Wetland (Sawyer et al., 2009). To more appropriately describe the general perennial freshwater marsh or wetlands potentially affected, the WHR fresh emergent wetland habitat type is used in this analysis. This habitat type also encompasses other subtypes, such as alkaline marsh.

Invasive Plant Species

An invasive species is defined by the National Invasive Species Council pursuant to Executive Order 13112 as "a species that is (1) non-native (or alien) to the ecosystem under consideration, and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (Center for Invasive Plant Management, 2011). A noxious weed, as defined by the California Department of Food and Agriculture (DFA), means any "species of plant that is, or is liable to be, troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate" (DFA, 2010a).

Many invasive non-native plant species occur within urban and agricultural lands in the Extended Study Area. A database of these species is not maintained by geographic area. The statewide inventories of the California Department of Food and Agriculture (DFA) and California Invasive Plant Council (Cal-IPC), as well as environmental documents covering some of the service areas, were reviewed for examples of invasive species likely to be affected by increased reliability of water supply in urban and agricultural areas of the Central Valley. A "wetland/marsh/aquatic" habitat query of the overall California Cal-IPC list was conducted for the perennial wetland habitats of the wildlife refuges in the Extended Study Area.

Special-Status Plant Species

Very few, if any, federally or State-listed plant species are expected to occur in urban and agricultural lands because appropriate habitat is lacking. The DFG Rarefind 4 was used to query the November 2009 CNDDB for all listed species in perennial wetland habitat categories in the 7 counties containing wildlife refuges that receive Level 4 water deliveries. The habitat categories included were Wetland, Swamp, Marsh/Swamp, Freshwater Marsh, and Alkali Marsh. The counties included were Merced, Fresno, Kern, Kings, Tulare, Glenn, and Colusa; an additional condition of elevational range lower than 2,700 feet was applied to exclude montane and sub-alpine species. Species occurring only in drying seasonal vernal pools were also omitted because they would most likely not benefit from more reliable water deliveries.

13.2.1.2 Vegetation Communities

Wildlife refuge perennial wetland or marshlands are classified as fresh emergent wetland in WHR (refer to Chapter 14 Terrestrial Biological Resources for descriptions). This habitat occurs in parts of affected National Wildlife Refuges (NWR) and Wildlife Areas (WA) from the Sacramento/Delevan NWRs in the north, to Kern and Pixley NWRs in the southern end of the San Joaquin Valley (Figure 1-7 in Chapter 1 Introduction). Fresh emergent wetland includes inland (non-coastal) alkaline wetlands, as well as completely freshwater wetland areas. Fresh emergent wetland habitats have greater than two percent cover by herbaceous species and less than 10 percent total cover by tree or shrub species. Because emergent wetlands are frequently flooded, their vegetation is adapted to being rooted in an anaerobic environment. Fresh emergent wetland habitats are characterized by erect, rooted water-dependent plants; dominant species are generally tall perennial grass-like plants such as cattails (*Typha*), bulrush (*Scirpus*), rushes (*Juncus*), sedges (*Carex*, *Cyperus*), arrowhead (*Sagittaria*), or saltgrass (*Distichlis*) if on more alkali sites. Freshwater wetlands are relatively stable over many thousands of years, but can accumulate sediments, and become replaced by upland communities over time. Soil substrates are generally silts and clays, or sometimes organic peats, in depressions or basins within a generally level to gently rolling landscape (Mayer and Laudenslayer, 1988). Freshwater emergent wetland or marsh does not include such seasonal wetlands as vernal pools or riparian (streamside) edges by moving waters.

13.2.1.3 Invasive Plant Species

Approximately 256 species of non-native weeds of varying degrees of invasiveness are known to occur throughout California (Cal-IPC, 2008). These occur in a wide range of habitats. Some (such as dandelion, bromes, thistles, mulleins, yellow star-thistle, and tumbleweeds) are well known from urban ruderal (i.e., weedy roadside) areas. Others, such as Johnson-grass, tall vervain, mustards, dock, or bindweed, are more common in agricultural areas, especially wet ditches and field margins. Others tend to invade riparian or wet habitats within urbanized areas, or spread into wildlands at the disturbed urban-wildland interface. One hundred thirty-four invasive species from the DFA 2008 list and 256 species from the Cal-IPC 2008 list are found in some part of the Extended Study Area, which includes much of California's Central Valley, but also extends into the Sierra foothills east of Oroville and Stockton, into the Bay Area, and also into southern coastal and desert lands.

The Cal-IPC query indicated that 33 invasive species are potentially present in wetland/marsh/aquatic habitats of the Extended Study Area. These species are listed in Table 13-1. This could be an underestimate because many water-tolerant riparian and upland invasive species can also occur in wetland edges.

Table 13-1
Invasive Weed Species Potentially Present in Wildlife Refuges Receiving Level 4 Water Supply in the Extended Study Area

Common Name	Scientific Name	Cal-IPC Wildland Impact Potential Rating	Habitats of Concern and Comments
Creeping bentgrass	*Agrostis stolonifera*	Limited	Wetlands, riparian; grown for domestic forage. Limited distribution.
Alligator weed	*Alternanthera philoxeroides*	High	Freshwater aquatic systems, including marshes.
Lens-podded white-top	*Cardaria chalepensis*	Moderate	Central Valley wetlands. Limited distribution in California. May not be as invasive as *C. draba*.
Hoary cress	*Cardaria draba*	Moderate	Riparian areas, marshes of central coast. More severely invasive in northern California.
Bull thistle	*Cirsium vulgare*	Moderate	Riparian areas, marshes, meadows. Widespread; can be a regional problem.
Pampasgrass	*Cortaderia selloana*	High	Coastal dunes, coastal scrub, Monterey pine, riparian, grasslands, wetlands, serpentine soils. Still spreading both coastal and inland.
Brazilian egeria	*Egeria densa*	High	Streams, ponds, sloughs, lakes, Sacramento-San Joaquin Delta.
Water hyacinth	*Eichhornia crassipes*	High	Aquatic systems in Sacramento-San Joaquin Delta.
Common velvet grass	*Holcus lanatus*	Moderate	Coastal grasslands, wetlands. Invasions can be more severe locally, especially in wetland areas.
Mediterranean barley, hare barley, wall barley	*Hordeum marinum, H. murinum*	Moderate	Grasslands; *H. marinum* invades drier habitats, and *H. murinum* invades wetlands. Widespread, but generally do not form dominant stands.
Yellowflag iris	*Iris pseudacorus*	Limited	Riparian, wetland areas, especially southern California. Limited distribution.
Perennial pepperweed, tall whitetop	*Lepidium latifolium*	High	Coastal and inland marshes, riparian areas, wetlands, grasslands; potential to invade montane wetlands.
Uruguay water-primrose	*Ludwigia hexapetala*	High	Freshwater aquatic systems.

Table 13-1
Invasive Weed Species Potentially Present in Wildlife Refuges Receiving Level 4 Water Supply in the Extended Study Area

Common Name	Scientific Name	Cal-IPC Wildland Impact Potential Rating	Habitats of Concern and Comments
Hyssop loosestrife	*Lythrum hyssopifolium*	Limited	Grasslands, wetlands, vernal pools. Widespread.
Purple loosestrife	*Lythrum salicaria*	High	Wetlands, marshes, riparian areas.
Pennyroyal	*Mentha pulegium*	Moderate	Vernal pools, wetlands. Poisonous to livestock. Spreading rapidly.
Parrotfeather	*Myriophyllum aquaticum*	High	Freshwater aquatic systems.
Hardinggrass	*Phalaris aquatica*	Moderate	Coastal sites, especially moist soils. Limited distribution. Can be highly invasive locally.
Japanese knotweed	*Polygonum cuspidatum*	Moderate	Riparian areas, wetlands, forest edges. Distribution limited in California.
Sakhalin knotweed	*Polygonum sachalinense*	Moderate	Riparian areas. Distribution limited in California.
Himalaya blackberry	*Rubus armeniacus*	High	Riparian areas, marshes, oak woodlands.
Red sorrel, sheep sorrel	*Rumex acetosella*	Moderate	Many habitats, riparian areas, forest, wetlands. Widespread.
Curly dock	*Rumex crispus*	Limited	Grasslands, vernal pool, meadows, riparian. Widespread. Impacts appear to be minor.
Ravennagrass	*Saccharum ravennae*	Moderate	Riparian scrub, marsh, and swamp.
Oppositeleaf Russian thistle	*Salsola soda*	Moderate	Marine systems, estuaries, vernal pool, marsh, and swamp.
Giant salvinia	*Salvinia molesta*	High	Freshwater aquatic systems. Population in San Diego River was eradicated.
Smooth cordgrass and hybrids, Atlantic cordgrass	*Spartina alterniflora* (and *S. alterniflora x foliosa* hybrids)	High	San Francisco Bay salt marshes and mudflats.
Common cordgrass	*Spartina anglica*	Moderate	San Francisco Bay salt marshes. Very severe impact in other countries. Limited distribution in California.
Dense-flowered cordgrass	*Spartina densiflora*	High	San Francisco and Humboldt Bay salt marshes.
Saltmeadow cord grass	*Spartina patens*	Limited	San Francisco Bay salt marshes. Very limited distribution. Invasion currently minor in California, but high in other countries.
Spanish broom	*Spartium junceum*	High	Coastal scrub, grasslands, wetlands, oak woodland, forests.
Tall vervain, seashore vervain	*Verbena bonariensis, Verbena litoralis*	Eval Not Listed	Often in disturbed areas of irrigation canals.
Calla lily	*Zantedeschia aethiopica*	Limited	Coastal prairie, wetlands. Invasion high in other countries, and may be locally high in California.

Source: Cal-IPC, 2008.

13.2.1.4 Special-Status Plant Species

Several special-status plant species are documented within fresh emergent wetland habitats within wildlife refuges receiving Level 4 water supply throughout the Central Valley. Twenty-five plant species on CNPS Lists 1, 2, and 3, including several State- or federally listed species, are known to occur in lower elevation marshy habitats in the 7 counties where wildlife refuges are located (DFG, 2010a). Species that are potentially present[1] in the affected wildlife refuges are listed in Table 13-2.

Table 13-2
Special-Status Species Potentially Present in the Extended Study Area

Common Name	Scientific Name	Federal Listing Status	State Listing Status	CNPS List[a]	Habitat
Henderson's bent grass	*Agrostis hendersonii*	None	None	3.2	Valley and foothill grassland, vernal pool, Wetland
Horn's milk-vetch	*Astragalus hornii* var. *hornii*	None	None	1B.1	Alkali playa, meadow and seep, wetland
Brittlescale	*Atriplex depressa*	None	None	1B.2	Alkali playa, chenopod scrub, meadow and seep, valley and foothill grassland, vernal pool, wetland
Vernal pool smallscale	*Atriplex persistens*	None	None	1B.2	Vernal pool, wetland
Lost Hills crownscale	*Atriplex vallicola*	None	None	1B.2	Chenopod scrub, valley and foothill grassland, vernal pool, wetland
Alkali mariposa-lily	*Calochortus striatus*	None	None	1B.2	Chaparral, chenopod scrub, desert wash, meadow and seep, Mojavean desert scrub, wetland
Pappose tarplant	*Centromadia parryi* ssp. *parryi*	None	None	1B.2	Coastal prairie, marsh and swamp, meadow and seep, valley and foothill grassland
Slough thistle	*Cirsium crassicaule*	None	None	1B.1	Chenopod scrub, freshwater marsh, marsh and swamp, riparian scrub, wetland
Hispid bird's-beak	*Cordylanthus mollis* ssp. *hispidus*	None	None	1B.1	Alkali playa, meadow and seep, wetland
Palmate-bracted bird's-beak	*Cordylanthus palmatus*	Endangered	Endangered	1B.1	Chenopod scrub, meadow and seep, valley and foothill grassland, wetland
Delta button-celery	*Eryngium racemosum*	None	Endangered	1B.1	Riparian scrub, wetland
Spiny-sepaled button-celery	*Eryngium spinosepalum*	None	None	1B.2	Valley and foothill grassland, vernal pool, wetland
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	None	Endangered	1B.2	Freshwater marsh, marsh and swamp, vernal pool, wetland
Woolly rose-mallow	*Hibiscus lasiocarpos* var. *occidentalis*	None	None	2.2[b]	Freshwater marsh, marsh and swamp, wetland

[1] Some of these species may not occur in the specific wildlife refuges that would benefit from a more reliable water supply because they may inhabit areas closer to the coast or in slightly different habitats or geographic areas.

Table 13-2
Special-Status Species Potentially Present in the Extended Study Area

Common Name	Scientific Name	Federal Listing Status	State Listing Status	CNPS List[a]	Habitat
California satintail	*Imperata brevifolia*	None	None	2.1	Chaparral, coastal scrub, meadow and seep, Mojavean desert scrub, riparian forest, wetland
Knotted rush	*Juncus nodosus*	None	None	2.3	Marsh and swamp, meadow and seep, wetland
Coulter's goldfields	*Lasthenia glabrata* ssp. *coulteri*	None	None	1B.1	Alkali playa, marsh and swamp, salt marsh, valley and foothill grassland, vernal pool, wetland
Colusa grass	*Neostapfia colusana*[c]	Threatened	Endangered	1B.1	Vernal pool, wetland
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*[c]	Threatened	Endangered	1B.1	Vernal pool, wetland
Hairy Orcutt grass	*Orcuttia pilosa*[c]	Endangered	Endangered	1B.1	Vernal pool, wetland
Slender-leaved pondweed	*Potamogeton filiformis*	None	None	2.2	Marsh and swamp, wetland
Sanford's arrowhead	*Sagittaria sanfordii*	None	None	1B.2	Marsh and swamp, wetland
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*	None	None	2.1	Marsh and swamp, meadow and seep, riparian forest, vernal pool, wetland
Greene's tuctoria	*Tuctoria greenei*[c]	Endangered	Rare	1B.1	Valley and foothill grassland, vernal pool, wetland
Brazilian watermeal	*Wolffia brasiliensis*	None	None	2.3	Marsh and swamp, wetland

[a]California Native Plant Society (CNPS, 2010): List 1A= plants presumed extinct in California; List 1B = plants rare, threatened, or endangered in California and elsewhere; List 2 = plants rare, threatened, or endangered in California but common elsewhere; List 3 = plants about which more information is needed to determine current status. CNPS threat codes: 0.1: Seriously endangered in California. 0.2: Fairly endangered in California; 0.3: Not very endangered in California.

[b]Listing status being changed to List 1B.

[c]These vernal pool grasses may not be affected if in entirely seasonal wetlands rather than perennial wetland parts of a refuge.

Source: CNPS, 2010.

13.2.2 Secondary Study Area

13.2.2.1 Methodology

Vegetation Communities

The vegetation types that could be affected by fluctuations in reservoir levels and changes in stream flow volumes are those within and around the immediate borders of the facilities included in the Secondary Study Area. A crosswalk (i.e., a cross-referencing table) (DFG, 2007)) for DFG's Manual of California Vegetation (MCV) and WHR habitats was used to determine the current MCV vegetation alliances or groups equivalent to the affected WHR habitats in the Secondary Study Area, which are: lacustrine, riverine, estuarine, valley foothill riparian, fresh emergent wetland, montane riparian (Trinity-Klamath River only), saline emergent wetland, barren, rice, irrigated grain crops, and irrigated row and field crops.

The maps of each vegetation alliance (Sawyer et al., 2009) were consulted to verify that each alliance is found within the Secondary Study Area.

Invasive Plant Species

For land at margins of lakes, rivers, marshes, estuaries, and croplands, the overall Cal-IPC list was searched with a query that included Wetland/marsh/aquatic and Riparian habitats. Similar to that described for the wetland habitats, this list is likely an underestimate because many invasive species found in similar habitats may not have been specifically listed as “riparian”. Species listed as typical mostly of desert, coastal, or southern California areas were not included.

Special-Status Plant Species

CDFG’s Rarefind 4 program was used to query the November 2009 CNDDB for all listed species in riparian and perennial wetland habitat categories in the 22 counties where affected CVP and SWP facilities are located. The habitat categories included were Aquatic, Estuary, Marine Bay, Klamath/North Coast flowing waters, Mud shore/flats, Riparian woodland, Riparian scrub, Sacramento/San Joaquin flowing waters and standing waters, Wetland, Swamp, Marsh/swamp, Freshwater Marsh, Brackish Marsh, Salt Marsh, and Alkali Marsh. The counties included were Alameda, Butte, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Marin, Placer, Sacramento, San Francisco, San Mateo, Santa Clara, Shasta, Solano, Sonoma, Sutter, Tehama, Trinity, Yolo, and Yuba. An additional condition of elevational range lower than 2,700 feet was applied to exclude high montane and sub-alpine species. Species occurring only in drying seasonal vernal pools were also omitted because they would likely be located in upland landforms.

In addition, species not appearing in the Rarefind 4 query, but included in DWR’s rare plant survey search list for the 2009 Bay-Delta Conservation Plan (BDCP) surveys, were added to the list of potentially affected special-status plant species if they occurred within water-related habitats or on riparian or drainage banks.

13.2.2.2 Vegetation Communities

Table 13-3 lists the vegetation alliances identified in the Manual of California Vegetation (MCV) that are expected to be affected by the alternatives, and a correlation of vegetation types or groups of types with WHR and with Secondary Study Area Project features. Vegetation alliances listed in the MCV crosswalk (a cross-referencing table) (DFG, 2007) were listed only if their mapped distribution (Sawyer et al., 2009) included Project features in the Secondary Study Area.

Table 13-3
Manual of California Vegetation Alliances in the Secondary Study Area

WHR Habitat Type	Corresponding MCV Vegetation Alliances	Project Features Likely to Support Some MCV Alliances
Valley foothill riparian (VRI)	Valley Oak, Fremont Cottonwood, Red Alder[a], Oregon Ash, Sitka Willow[a], California Sycamore, Central California Sycamore, Southern Sycamore-Alder, Foothill Sycamore, Black Willow, Red Willow, Narrowleaf Willow, Sandbar Willow, Hooker Willow[a], Shining [=Pacific] Willow, Mulefat, Mexican Elderberry, Arroyo Willow, Buttonbush and California Rose, Torrent Sedge, Creeping Wildrye Turf	Feather River Sacramento River Clear Creek American River Parts of: Yolo Bypass Sutter Bypass Sacramento-San Joaquin Delta

Table 13-3
Manual of California Vegetation Alliances in the Secondary Study Area

WHR Habitat Type	Corresponding MCV Vegetation Alliances	Project Features Likely to Support Some MCV Alliances
Fresh Emergent Wetland (FEW)	Large (Hardstem) and California Bulrush, Bulrush-Cattail Wetland, Bur-reed Wetland, Common Reed Marsh, Duckweed Wetland, Giant Reed, Mosquito Fern Wetland, Pondweeds, Quillwort Wetland, Spikerush, Yellow Pond Lily, Alkali Common Reed, Baltic Rush-Mexican Rush, Baltic Rush Riparian Grassland, Common Rush Riparian Grassland, Common Three-Square, Ditch-grass Wetland, Inflated Sedge, Knotweed-Echinochloa Riparian Grassland, Mexican Rush Riparian Grassland, Slough Sedge, and Small-fruited Bulrush, Whiteroot Beds[b], Pale Spikerush Marsh, Meadow Barley, Soft Rush Marsh, Creeping Wildrye Turf	Along edges, backwaters, and confluences of rivers and streams Parts of: Sacramento-San Joaquin Delta Suisun Bay San Pablo Bay San Francisco Bay Thermalito Complex
Saline Emergent Wetland (SEW)	Large Bulrush, Bulrush-Cattail Wetland, Cattail Wetland, Cordgrass Saline/Alkaline Grassland, Ditch-grass Wetland, Pickleweed Wetland, Alkali Bulrush, Alkali Common Reed, Alkali Heath Dwarf Scrub, Baltic Rush-Mexican Rush, Bigelow Pickleweed-Common Pickleweed, Brass Buttons, Common Three-Square, Cooper Rush Riparian Grassland, Creeping Wildrye Turf, Dense-flowered Cordgrass, Gumplant, Knotweed-Echinochloa Riparian Grassland, Mexican Rush Riparian Grassland, Pacific Silverweed Marsh, Perennial Pepperweed, Salicornia Europaea Seasonally Flooded Herbaceous, Saltgrass Flats, Salt Marsh Bulrush, Slough Sedge, Spearscale, and Swamp Timothy	Parts of: Sacramento-San Joaquin Delta Suisun Bay San Pablo Bay San Francisco Bay
Rice	None	Parts of: Yolo Bypass Sutter Bypass
Barren	None Note: weedy species and occasional opportunistic native herbaceous species can colonize for short periods	Drawdown zones in: Lake Oroville Shasta Lake Keswick Reservoir Trinity Lake Lewiston Reservoir Whiskeytown Lake Folsom Lake Mudflats around: Suisun Bay Upper San Francisco Bay
Riverine, Lacustrine, Estuarine	None; these types consist of greater than 98 percent open water and less than 2 percent cover vegetation in shore zone	All
Irrigated row or field crops	None	Parts of: Yolo Bypass Sutter Bypass

[a]Alliances in Klamath River area only
[b]Alliances at Lewiston, Whiskeytown reservoirs only
Source: DFG, 2007; associations within Alliances are in DFG, 2010b

The central waterway of the Secondary Study Area is the Sacramento River. Historically, the edges and floodplain of the Sacramento River supported several riparian vegetation communities. At water's edge, willow riparian scrub and annual plants occupied the shifting gravel and sand bars and banks. Well-developed multiple-storied cottonwood and sycamore riparian forests lined inner terraces, transitioning into mixed species and then valley oak cathedral forests on the somewhat higher terraces. Currently, in most of the Secondary Study Area, less than 15 percent of this original riparian corridor remains along the Sacramento River. It is now represented by narrow strips in a pattern interrupted by agriculture (mostly orchards) down to the river's edge.

13.2.2.3 Invasive Plant Species

Approximately 73 species of non-native weeds of varying degrees of invasiveness are known to occur in riparian and aquatic habitats in the northern half of California (Cal-IPC, 2008). Adding the 32 species resulting from a Wetland/marsh/aquatic habitat query of the Cal-IPC list, and eliminating duplicates, a total of 77 weed species potentially exist in the water-edge habitats of the Secondary Study Area. These species are listed in Appendix 13A. This could be an underestimate because many facultative riparian and upland weed species can also occur in wetland edges. In addition, many additional invasive plant species may occur in the agricultural areas of the Yolo and Sutter Bypass portions of the Secondary Study Area.

Some examples of weedy species that could be affected by changes in water levels or timing of flows are stands of Poison hemlock (*Conium maculatum)* or fennel *(Foeniculum vulgare*), Pampas grass (*Cortaderia selloana*), Perennial pepperweed (*Lepidum latifolium*), Giant reed (*Arundo donax*), and Montevideo waterweed (*Ludwigia peploides* ssp. *montevidensis*) in Suisun Marsh, other locations around the edges of San Francisco Bay and the Delta, Bypass areas, and river and stream floodplains.

13.2.2.4 Special-Status Plant Species

In riparian, aquatic, and wetland habitats within affected SWP and CVP areas throughout northern California, including the Trinity/Klamath River and San Francisco Bay and Delta, numerous special-status plant species are documented. There are 114 plant species on CNPS lists 1, 2 and 3, including several State- or federally listed species that are known to occur in lower-elevation water-related habitats in the 22 counties containing affected SWP or CVP facilities (DFG, 2010a; CNPS, 2010). These species are summarized by listing status on Table 13-4 and are listed in greater detail in Appendix 13B. Some of these species may not occur at the specific Project features or facilities affected by changing Project operation flows, because they may occur in slightly different habitats or geographic areas. However, these species are potentially present in the affected Secondary Study Area streamside, wetland/marsh, or aquatic areas.

Five smaller geographic regions within the Secondary Study Area that are based on climatic and other biogeographic differences were defined for the discussion of potentially affected special-status plant species (Figure 13-1). The numbers of special-status plant species that are expected to occur in each of these geographic regions are listed in Table 13-5.

As indicated in Table 13-5, the Bay/Delta portion of the Secondary Study Area supports the greatest number of potentially affected special-status plant species. Some of these, such as Delta button celery (*Eryngium racemosum),* a State endangered species, or Suisun Marsh aster (*Symphyotrichum lentum)* and Carquinez goldenbush (*Isocoma arguta)*, both CNPS List 1B species, occur only in the Bay-Delta part of the Secondary Study Area.

Table 13-4
Number of Special-Status Plant Species by Rank in the Secondary Study Area

Status		Number of Species
Federal	Endangered	11
	Threatened	2
Subtotal		**13**
State	Endangered	2
	Rare	1
Subtotal		**3**
California Native Plant Society*	List 1A	2
	List 1B	49
	List 2	30
	List 3	2
	List 4	15
Subtotal		**98**
TOTAL		**114**

*California Native Plant Society (CNPS, 2010): List 1A= plants presumed extinct in California; List 1B = plants rare, threatened, or endangered in California and elsewhere; List 2 = plants rare, threatened, or endangered in California but common elsewhere; List 3 = plants about which more information is needed to determine current status. CNPS threat codes: 0.1: Seriously endangered in California. 0.2: Fairly endangered in California; 0.3: Not very endangered in California.

Source: DFG, 2010a; CNPS, 2010.

Table 13-5
Number of Special-Status Plant Species by Region and Status

Status	Region				
	North Coast	**Shasta**	**Central Valley**	**Bay/Delta**	**Folsom**
Federal	1	0	5	9	3
State	0	1	1	3	2
CNPS 1A	0	0	0	2	0
CNPS 1B	8	6	18	33	5
CNPS 2	12	9	7	8	0
CNPS 3	0	0	1	1	0
CNPS 4	4	2	7	13	1
TOTAL	**25**	**18**	**39**	**69**	**11**

Note:

Totals for the regions add up to 162 rather than 114 because some of the 114 species are present in more than one region.

Source: DFG, 2010a; CNPS, 2010.

However, other portions of the Secondary Study Area also support special-status plant species not found in any other region. For example, several plant species are found only in the North Coast (Trinity-Klamath Rivers) portion of the Secondary Study area, such as Western lily *(Lilium occidentale)*, a federally endangered species, and Howell's miner's-lettuce (*Montia howellii)*, a CNPS List 1B species. This northwest coastal area is influenced by its unique proximity to the north coast, with Klamath region serpentine substrates and high rainfall.

Similarly, several species are known only from the Folsom area, such as federally endangered Sacramento orcutt grass (*Orcuttia viscida)*, or Myers' pincushionplant (*Navarretia myersii* ssp. *myersii),* a CNPS List 1B species. The Folsom area foothill-valley edge has vernal pool and gabbro/serpentine substrates that support unique sets of plant species.

Special-status plants unique to the cool mountainous Shasta area include Shasta snow wreath (*Neviusia cliftonii)* and Howell's alkali grass (*Puccinellia howellii),* both CNPS List 1B species.

Special-status plants occurring mainly in the Central Valley include vernal pool species such as federally listed Greene's tuctoria (*Tuctoria greenei)* and Colusa grass (*Neostapfia colusana)*, as well as highly localized foothill-valley edge species such as federally endangered Butte County meadowfoam (*Limanthes floccosa* ssp. *californica)* and Sacramento cryptantha (*Cryptantha crinita),* a CNPS 1B species. Several species such as Palmate-bracted bird's-beak (*Cordylanthus palmatus* [federally and State endangered]), Pappose tarweed (*Centromadia parryi* [CNPS List 1B]), and three saltbushes (*Atriplex* spp. [all CNPS List 1B]), are found in both the alkaline wetlands of the Central Valley and the brackish marsh edges of the Bay-Delta. The only potentially affected special-status plant species known from all parts of the Secondary Study Area is Sanford's arrowhead (*Sagittaria sanfordii),* a CNPS List 1B species that is found at pond edges.

13.2.3 Primary Study Area

13.2.3.1 Methodology

Vegetation Communities

CNPS and DFG have classified natural plant communities in California for broad scale resource inventory and assessment. This classification system defines characteristics for general vegetation types and for rare communities (Sawyer and Keeler-Wolf, 1995). These classifications were used as the first step to define the natural vegetation communities and associations in the Primary Study Area that may be affected by the proposed Project features (DWR, 2005). Associations or vegetation types were added to these classifications to encompass the variation of dominant species composition and vegetation structure (density of cover) that was found in the vicinity of proposed Project facilities, especially areas lying outside the confines of the reservoir footprints.

Vegetation within the proposed reservoir footprint was mapped in 1998 (DWR, 2005). Vegetation in and adjacent to other features, including proposed road relocation routes, conveyance routes, and recreation areas, were mapped in 2000 to 2001. Reservoir footprint vegetation types were delineated by hand on overlays over hard-copy true-color aerial photos (1:6,000; 1:12,000). The polygons were field-verified and then digitized using computer mapping software (AutoCad, converted to ArcView [ESRI, 1998]). Vegetation types in feature areas outside of the proposed reservoir footprint were delineated directly on-screen using "heads-up digitizing" in ArcView 3.x (ESRI, 2000) over geo-referenced true-color digital aerial photo images (1:7,200, 1:12,000 and 1:30,000) flown in 1997 for the proposed Project. Interpretation of vegetation composition was based on prior familiarity from 3 years of rare plant surveys. In addition, field verification of the proposed reservoir footprint occurred after initial mapping was completed.

In vegetation mapping for features outside of the proposed reservoir footprint, vegetation types were defined somewhat more finely for dominant woody species and vegetation density than in the earlier reservoir footprint mapping. However, all vegetation types used were easily convertible, and the resulting polygons for both were integrated into a single mapping coverage (shapefile). The 2001 vegetation mapping for the Primary Study Area was partially updated in 2004 based on field observations in selected sampling sites. This original vegetation mapping included lands surrounding all proposed Project features covered by aerial photography, a total of 104,331 acres. In addition, computer mapping software (ArcGIS v. 9.2) was used in 2010 to obtain acreages and percent cover for each vegetation type occurring within the Primary Study Area. Acres of each vegetation type were also mapped using similar methods for the "construction disturbance area," which represents the maximum potential ground disturbance area resulting from construction activity.

Invasive Plant Species

A list of weed species potentially occurring in and in the vicinity of the Primary Study Area was created by listing all species from the current Federal Noxious Weed List (USDA, 2005), DFA list (DFA, 2010b), and the Cal-IPC list (Cal-IPC, 2010) and adding those from the local Colusa-Glenn-Tehama Weed Management Area (CGT WMA, 2002). Also added were species of concern to the Mendocino National Forest (Ruhl, 2006). This original list contained 83 species. Likelihood of occurrence of these 83 species was evaluated based on documented occurrences for Colusa and/or Glenn counties in CalFlora, DFA, or local floras (Oswald, 2002), and whether the species was found during Project field surveys. Species known only from habitats, elevations, or geographical localities not extending into the Primary Study Area (e.g., montane species or those not known to occur west of the Sacramento River) were not included.

Invasive plant species found during Project surveys were assigned a high probability of occurrence. Species not found during surveys, but previously recorded from Glenn and Colusa counties, were assigned a medium probability of occurrence.

Special-Status Plant Species

Lists of special-status plant species potentially affected by the proposed Project were developed prior to conducting the 1998 to 2003 field surveys. The initial list of federal- and State-listed species, species of concern (CNPS lists 1, 2, and 3), and species of limited distribution (CNPS List 4) was compiled after consulting DFG, CNPS, and USFWS references and regional specialists (DWR, 2005) regarding known occurrences within the Primary Study Area. The list was then updated each year prior to continuation of surveys, using the current version of Rarefind, CNDDB, letter requests to USFWS and the updated CNPS Inventory (DWR, 2005).

To develop a June 2009 baseline for a list of potentially affected species for this document, DFG's October 2009 Special Plants List (DFG, 2010c) was used, along with the CNPS 3-month list of additions, deletions, name changes, and list or rank changes. There were no changes affecting the Primary Study Area. The October 2009 DFG Special Plants List was used as a cross-check to ensure that a list generated by a November 2009 CNDDB query was as close as possible to a summer 2009 list. CDFG's Rarefind 4 program was used to query the November 2009 CNDDB for all listed species in all habitats, in 16 USGS 7.5-minute quadrangle maps encompassing the Primary Study Area and nearest known special-status plant occurrence sites, including: Colusa, Gilmore Peak, Hough Springs, Lodoga, Leesville, Logan Ridge, Logandale, Manor Slough, Maxwell, Moulton Weir, Princeton, Rail Canyon, Salt Canyon, Sites, Stonyford, and Williams. An additional condition of elevational range lower than 3,000 feet was applied to exclude high montane and sub-alpine species. A GIS selection from the November 2009 CNDDB spatial files based on the same 16 quadrangle maps was consulted for additional species in the Primary Study Area known from less than 3,000 feet elevation. This 2009 list of potentially affected special-status plant species was used as a baseline in this report, although field surveys were conducted using earlier lists. This 2009 list is included in Tables 13-9 and 13-10.

A list was prepared of special-status plant species with limited distribution, on CNPS List 4, with potential to occur in the Primary Study Area as of the time of Project field surveys (1998 to 2003). This list was compiled from the original list developed in 1997 (DWR, 2005), and updated to reflect species present on the latest CNPS lists at the time (CNPS, 2001, 2002, 2003). This list is included in Table 13-11. The list has been updated again (May 2010) for this document (CNPS, 2010). The sole information source is the CNPS Inventory, which tracks List 4 species only at the county level.

Field surveys were conducted for special-status plant species within the proposed Sites Reservoir footprint in 1998 and 1999, and within potential routes for conveyances, recreation areas, and road relocations in 2000 through 2003. Additional proposed Project features (Eastside Road extension to Road 69, Holthouse Reservoir Complex, and the redesigned Delevan Pipeline Intake/Discharge facilities) were surveyed in 2010 and 2011. Survey corridors in 2000 and 2001 were 500 feet wide for road relocation routes, and 1,000 feet wide or more for conveyance routes. Survey corridors were 1,500 feet wide for all features surveyed in 2002 and 2003. The Eastside Road extension route was surveyed in a corridor of 100 feet to either side of a centerline; for the proposed Holthouse Reservoir Complex and the Delevan Pipeline Intake/Discharge facilities, entire footprints were surveyed. Botanical surveys were conducted according to established guidelines and protocols (Nelson, 1987; CNPS, 1994; DFG, 1984; DFG, 2000; DFG, 2009a; and USFWS, 1996). Pursuant to these guidelines, focused habitat-specific surveys were conducted, using wandering transect methodology, between February and October. These months coincided with the appropriate flowering and fruiting stages necessary for the identification of most plant species occurring in the area, including all special-status species (Tables 13-9 and 13-10).

Field survey activities and plant identifications were documented throughout the multiple-year study, including dates, location, authorized property access, and assigned personnel (DWR, 2005).

Land not surveyed included properties for which authorized access was not obtained, private residences and yards, cemeteries, agricultural fields, and some bedrock stream channels and vertical slopes. Also not surveyed were areas that do not support suitable habitat for the special-status species, such as impenetrable woodland, chaparral or scrub areas, and large solid stands of Yellow star-thistle (*Centaurea solstitialis*). Some creek channels and vertical slopes were examined with binoculars where habitat appeared potentially suitable for certain species. Also not surveyed were lands outside of defined proposed Project feature corridors. Within defined proposed Project feature areas, lands with degraded or otherwise marginal or unsuitable habitat not warranting further surveys were surveyed less thoroughly. Areas with high quality potential habitat were prioritized and surveyed throughout the flowering period with more complete transect coverage. Habitat parameters, including mapped soils, aspect, and plant associates, defined the number of return visits and the level of coverage. In each Project feature area, small areas of potential habitat remain unsurveyed due to field season time constraints or lack of access authorization. Within time constraints of each season, 100 percent survey coverage was attempted in potential habitat known to support the special-status plant species, with special emphasis on federal- or State-listed species and those on CNPS lists 1, 2, or 3. Habitat for CNPS List 4 species was also checked carefully as it was encountered during surveys for more seriously threatened species.

Plant species were identified and recorded in the field whenever possible, or preserved in a voucher collection for identification at a later date. The voucher collection consists of plant specimens that were collected and preserved as proof for species on the plant inventory lists. Data collected for each special-status species occurrence included habitat parameters, approximate number of individuals, phenological state (stage of maturity), full location description, plant community associates, existing site conditions, and present or possible threats to the population. Occurrence definitions in this analysis follow the CNDDB occurrence reporting standard of at least 0.25 mile separation between stands or colonies of a special-status species. Detailed descriptions of survey methodology, area surveyed, and documentation of findings are provided in the NODOS Botanical Resources Progress Report (DWR, 2005).

13.2.3.2 Plant Species Biology and Life History of Federal- or State-Listed Species

None of the species presented in Table 13-9 were found during Project field surveys in the Primary Study Area. Three of the species in Table 13-9 are not likely to be present in the Primary Study Area because of lack of suitable elevation, substrate, and other habitat elements. They are Milo Baker's lupine (*Lupinus milo-bakeri* [occurs above 1,300 feet elevation]), Indian Valley brodiaea (*Brodiaea coronaria* ssp. *rosea* [occurs on serpentine soils]), and Red Mountain catchfly (*Silene campanulata* ssp. *campanulata* [occurs over 1,300 feet on serpentine substrate]).

Hoover's spurge *(Chamaesyce hooveri)*, Hairy Orcutt grass (*Orcuttia pilosa)*, Palmate-bracted bird's-beak (*Cordylanthus palmatus)*, and Greene's tuctoria (*Tuctoria greenei)* may occur within the Primary Study Area. Palmate bracted bird's beak has been reported within a few miles of either side of the GCID Canal in habitats similar to some of those traversed by the GCID Canal (DFG, 2009b). However, Palmate-bracted bird's-beak is restricted to alkali wetland habitats, which have been mostly converted to intensive agriculture in the Primary Study Area. Colusa-grass *(Neostapfia colusana)* has been extirpated (locally extinct) from the Colusa County portion of its former range (DFG, 2009b; USFWS, 2006). Potential habitat for some of these species may exist in the footprint for the proposed Holthouse Reservoir southeast of the existing Funks Reservoir.

The remaining federally listed plant species, Keck's checkerbloom (*Sidalcea keckii*), may occur within the Primary Study Area, in grassy areas within open blue oak woodland in hills around the western side of the proposed Sites Reservoir footprint. This species was not thought to occur in the northern half of California during the time of Project surveys.

Indian Valley brodiaea (*Brodiaea coronaria* ssp. *rosea*)

Indian Valley brodiaea, a State Endangered species, is a perennial herb in the Lily family (Liliaceae) that flowers in May and June. Its habitat includes closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grasslands on serpentinite soils typically at elevations ranging from 1,100 to 4,760 feet (335 to 1,450 meters), but has been observed as low as 100 feet (30 meters) (Oswald, 2002). It has been found in gravelly creek bottoms, meadows and swales, and other vernally moist sites with serpentine substrates. Thirteen occurrences of Indian Valley brodiaea have been reported in Colusa, Glenn, Lake, and Tehama counties (two of which are possibly extirpated) (DFG, 2010a). These sites are on lands owned and managed by BLM, USFS, private parties, and unknown entities. Known populations occur within six miles of the Primary Study Area. Some plant species thought to occur only on serpentinite can sometimes be found downslope or downstream from serpentine areas on contiguous non-serpentine substrate. Therefore, potential habitat may exist, but is not likely, within the western portion of the Primary Study Area. Existing threats to these populations have been identified, including inundation by reservoir construction, mining, off-road recreational vehicle activity, road or trail construction, horticultural collecting, vandalism, and dumping. Populations are protected, in part, at a BLM Area of Critical Environmental Concern in Lake County.

Hoover's spurge (*Chamaesyce hooveri*)

Hoover's spurge, a federal Threatened species, is also listed on CNPS List 1B. It is an annual herb in the spurge family (Euphorbiaceae) that flowers in July and August. Its habitat is limited to vernal pools at elevations ranging from 80 to 820 feet (25 to 250 meters). Its preferred substrate is deeply cracking adobe clay. Hoover's spurge has been reported from 29 occurrences in California: 20 are clustered in Butte, Glenn, and Tehama counties; three are in Stanislaus and Merced counties, and six are in Tulare County. Of the 20 occurrences north of San Joaquin County, all except four are at or near The Nature Conservancy's (TNC) Vina Plains Preserve. Known occurrences are on properties owned or managed by DFG, USFWS, TNC, and private and unknown parties. Known populations occur within seven miles of the Primary Study Area in the Sacramento NWR. Potential habitat may exist in parts of the Primary Study Area wherever vernal pools occur. Existing threats to this species include agriculture, altered hydrology, erosion or runoff, trampling, grazing, and competition from non-native plants. Populations are protected, in part, at the DFG Stone Corral Ecological Reserve in Tulare County, USFWS Sacramento NWR, and TNC Vina Plains Preserve, but most occurrences of Hoover's spurge are on privately owned land (USFWS, 2002).

Palmate-bracted bird's-beak *(Cordylanthus palmatus)*

Palmate-bracted bird's-beak, a State and federal Endangered species, is an annual herb in the Snapdragon family (Scrophulariaceae) that flowers from May through October. Its habitat is vernally (springtime) wet open flats with chenopod (Goosefoot family) scrub on saline/alkaline soil in valley and foothill grassland at elevations ranging from 16 to 510 feet (5 to 155 meters). Twenty-six occurrences of Palmate-bracted bird's-beak are known from Alameda, Colusa, Fresno, Glenn, Madera, San Joaquin and Yolo counties (DFG, 2010a). However, the five occurrences of this species in Madera County are thought to be extirpated, and the two occurrences listed for Glenn County and one for Fresno County are recent re-introductions. The 18 remaining natural populations occur on land owned and managed by the City of Woodland, DFG, City of Livermore, USFWS, and private parties. It is known to occur within two miles of the Primary Study Area; these occurrences in Colusa County (Delevan NWR) represent the northernmost occurrences in the existing natural range of this species. Potential habitat exists in the proposed Delevan Pipeline construction disturbance area, and in the proposed Holthouse Reservoir footprint. Existing threats include agriculture, urbanization, altered hydrology, competition from exotic plants, biocides, grazing, ORV use, vandalism/dumping, and road and trail construction. Populations are protected at the DFG Alkali Sink Ecological Reserve and Mendota Wildlife Area, and at the Colusa, Delevan and Sacramento NWRs.

Milo Baker's lupine (*Lupinus milo-bakeri*)

Milo Baker's lupine, a State Threatened species, is not recognized as a distinct species in the current Jepson Manual (Hickman, 1993), but instead is considered part of Pale yellow lupine (*Lupinus luteolus).* This lupine is, however, recognized as a distinct species by the CNDDB and the CNPS Inventory (CNPS, 2009). Compared to the yellow-flowered assumed parent, Pale yellow lupine, Milo Baker's lupine plants are apparently taller and flowers have a bluish-purplish tinge. This annual herb in the pea family (Fabaceae) flowers from June through September. Its habitat is vernally wet gravelly depressions such as drainage channels, ditches, and often roadsides in cismontane woodland and foothill and valley grasslands at elevations ranging from 1,300 to 1,410 feet (395 to 430 meters). *L. milo-bakeri* has been reported from 13 occurrences in Colusa and Mendocino counties (DFG, 2010a). At least four of the Mendocino County sites may have been extirpated, and three are recent re-introductions. The remaining six sites are not located near the Primary Study Area. Known occurrences are on land owned and managed by Bureau of Indian Affairs (BIA), California Department of Transportation (CALTRANS), and private parties. Potential habitat exists in the vicinity of the Project; the closest occurrence is in Bear Valley, approximately seven miles southwest of the Primary Study Area and 13 miles from the town of Sites. This species is currently threatened by biocides, grazing, and road and trail construction.

Colusa grass (*Neostapfia colusana*)

Colusa grass, a State Endangered and federal Threatened species, is an annual grass that flowers from May to August. Its habitat is large and/or deep vernal pools and alkali playas, on uncultivated adobe and saline/alkaline clay soils, at elevations ranging from 16 to 660 feet (5 to 200 meters). Colusa grass is reported from 59 occurrences in Colusa, Merced, Solano, Stanislaus, and Yolo counties (DFG, 2010a). However, this species is thought to be extirpated from Colusa County, and from some sites in Stanislaus, Merced, and Glenn counties. Colusa grass occurs on land owned by TNC, Solano County Farmlands and Open Space Foundation, Stanislaus County, the U.S. Department of Defense, private parties, and unknown entities. Potential habitat occurs in the vicinity of the Project; the one reported occurrence in Colusa County was in alkali pools beside what is now County Road 68 between Princeton and Norman, three to nine miles east of I-5, approximately four miles to the north of the proposed Delevan Pipeline route and 10 miles east of the proposed Sites Reservoir footprint. Potential habitat for Colusa grass also exists in the proposed Holthouse Reservoir footprint. The nearest occurrence that still exists is over 60 miles to the southeast in Yolo County. Existing threats to these populations include agricultural practices and grazing, altered flood regime and surface water diversion, biocides, competition from exotics, inundation, foot traffic, off-road vehicle activity, and road construction. Some populations are protected by TNC and Solano County Farmlands and Open Space Foundation.

Hairy Orcutt grass *(Orcuttia pilosa)*

Hairy Orcutt grass, a State and federal Endangered species, is an annual grass that flowers from May to September. Its preferred habitat is drying edges and beds of vernal pools in heavy clays, ranging in elevation from 180 to 660 feet (55 to 200 meters) (CNPS, 2010). Thirty-four occurrences of Hairy Orcutt grass have been reported in Butte, Glenn, Madera, Merced, Stanislaus, and Tehama counties (DFG, 2009b). However, several of these occurrences have been extirpated, many in Merced County. Existing populations occur on land owned by Reclamation, CALTRANS, TNC, USFWS, and private parties. Potential habitat exists within the vicinity of the Project, and known populations occur within six miles of the Primary Study Area in the Sacramento NWR. Nine known occurrences, in and near Vina Plains, are several miles east of the Sacramento River in southern Tehama County. Existing threats include agriculture, competition from exotic plants, development, grazing, off road vehicle use, and road and trail construction. Some populations are protected at the TNC Vina Plains Preserve and at the Sacramento NWR.

Keck's checkerbloom *(Sidalcea keckii)*

Keck's checkerbloom, a federal Endangered species, is an annual herb that flowers from April to May. This plant was presumed extinct in the 1993 Jepson Manual (Hickman, 1993), was rediscovered in 1992, listed at the federal level in February 2000 (CNPS, 2010), and added back into the CNPS online inventory in 2004 as a List 1B species (U.C., 2004). Many specimens of *S. keckii*, including those nearest the Primary Study Area, were originally thought to be the common fringed checkerbloom *(Sidalcea diploscypha)*; these specimens were annotated to Keck's checkerbloom by Steven Hill in 2008 (U.C. Consortium, 2011). Its habitat consists of clay soils often of serpentine origin, in valley and foothill grassland and open woodland, at elevations from 394 feet (120 meters), to over 1,394 feet (425 meters). Sixteen occurrences of Keck's checkerbloom are reported in Colusa, Fresno, Merced, Napa, Solano, Tulare, and Yolo counties (DFG, 2010a). One occurrence is considered to be extirpated from Tulare County. Existing populations occur on land owned and managed by TNC, DFG, BLM, Reclamation, private parties, and unknown entities. Potential habitat occurs along the western edge of the Primary Study Area. One occurrence is immediately northwest of the Primary Study Area, and three occurrences are in Colusa County in the vicinity of the existing East Park Reservoir. The remaining 11occurrences are not located near the Primary Study Area. Existing threats include grazing, utility maintenance, and competition from exotic plants. The identity of the plants assigned to Keck's checkerbloom from the northern end of the species' distribution, in Colusa, Napa, Solano and Yolo counties, has not yet been confirmed by ongoing scientific investigations. The necessary molecular work needed to resolve the question of whether these plants are truly Keck's checkerbloom is still in progress as of mid-2010 (Baldwin, 2010). This includes the specimens collected during Project field surveys from the hills along Grapevine Creek, at the western edge of the Primary Study Area.

Red Mountain catchfly (*Silene campanulata* ssp. *campanulata*)

Red Mountain catchfly, a State Endangered species, was listed on CNPS List 1B during field surveys conducted in 1998 to 2003; it is on List 4 as of 2010. This species is a perennial herb in the carnation family (Caryophyllaceae) that flowers from May to June. Its habitat includes chaparral and lower montane coniferous forest with serpentinite or rocky soils at elevations ranging from 1,390 to 6,840 feet (425 to 2,085 meters). CNDDB information dating back to this species' List 1B status (Skinner & Pavlik, 1994) indicates that seven occurrences of this California endemic plant have been found in Colusa and Mendocino counties. These populations occur on land owned and managed by BLM and private parties. This species also occurs in Glenn, Tehama, Del Norte, Humboldt, Trinity and Shasta counties. The current CalFlora Occurrence Database lists 24 records, some of which may be duplicate entries, so the species does not have a large number of known occurrences. A known population of Red Mountain catchfly grows within five miles of the Primary Study Area. The proposed Project facilities are located well below the observed elevation range of the species. Existing threats include erosion or runoff, mining, and possibly logging activities.

Greene's tuctoria *(Tuctoria greenei)*

Greene's tuctoria, a federal Endangered species, is an annual grass that flowers from May to July. Its habitat consists of drying small or shallow vernal pools, or the early-drying portions of large deeper vernal pools, mostly at elevations less than 660 feet (200 meters), but can occur over 3,000 feet (1,065 meters). These sites occur mostly in open grassland, on Anita clay or reddish clays of Tuscan or other volcanic origin, but can be found on alkaline adobe clay substrate. Forty-five occurrences of Greene's tuctoria are known (DFG, 2010a). Twenty-one of those populations occur in Merced, Butte, Shasta, and Tehama counties. Nineteen other occurrences are thought to be extirpated from Fresno, Stanislaus, Tulare, and San Joaquin counties, as well as others extirpated from Madera County. One additional occurrence, known from a herbarium specimen, exists in Glenn County on the Sacramento NWR (Oswald, 2002; U.C. Consortium, 2011). The remaining four occurrences are not located near the Primary Study Area. Existing populations occur on land owned and managed by TNC, USFWS, private parties, and unknown entities. Potential habitat occurs within the vicinity of the Project. The Sacramento NWR occurrence is within 10 miles of the Primary Study Area and within seven miles of the proposed Delevan Pipeline route. Existing threats include agriculture, altered hydrology and surface water diversions, competition from exotic plants, and grazing. Populations are protected, in part, at TNC Vina Plains Preserve, and the Sacramento NWR.

13.2.3.3 Plant Species Biology and Life History of *Species of Concern*

Bent-flowered fiddleneck *(Amsinckia lunaris)*

Bent-flowered fiddleneck is a CNPS List 1B species, considered to be "fairly endangered in California." This upright annual forb in the borage family (Boraginaceae) grows one to three feet tall. It flowers from March to June, and flowers must be present to distinguish it from co-occurring common look-alike species. It is found in grassy openings on slopes in oak woodlands with chaparral understories and coastal scrub. It exists at elevations of 10 to 1,500 feet (3 to 500 meters) on crumbly shale, mudstone, clay, and serpentine substrates (CNPS, 2010; Kelley and Patterson, 2011). There are currently 50 occurrences recorded for Bent-flowered fiddleneck, scattered in the central Coast Ranges from Lake County through most counties south to San Benito County (DFG, 2010a). Many recorded occurrences are old and may no longer exist. Prior to Project surveys in 2001 to 2004, the occurrences nearest to the Primary Study Area were approximately seven miles to the west, near the Colusa/Lake County line. Three new occurrences of Bent-flowered fiddleneck were found during Project surveys in the hills to the west and east of the proposed Sites Reservoir footprint. Additional occurrences of this species may occur in suitable habitat that exists in the hills surrounding the reservoir footprint, especially the canyons along the western side. Because it is very similar in appearance to common species, this species may have been overlooked in early Project surveys in those areas. Primary Study Area occurrences represent the northeasternmost extent of the range for this species.

Jepson's milkvetch (*Astragalus rattanii* var. *jepsonianus*)

Jepson's milkvetch is a CNPS List 1B species, considered to be "fairly endangered in California." This annual herb in the pea family (Fabaceae) grows from 1.5 to 12 inches tall, lying partly on the ground but with erect stem tips, and flowers from April through June. It is found in shaley mudstone or serpentinite soils in woodland, chaparral, or grassland at elevations from 1,000 to 2,000 feet (300 to 600 meters). There are 29 occurrences recorded for Jepson's milkvetch (DFG, 2009b), narrowly distributed over in the Inner Coast Ranges from western Tehama County to Napa County, in a band approximately 110 miles long by five to 20 miles wide. Most occurrences are thought to still exist, but many have not been recently confirmed. Three occurrences are known from hills approximately seven miles west of the Primary Study Area. Existing threats to this species include road maintenance and off-road vehicle use (CNPS, 2010). Potential habitat is present in the Primary Study Area in the hills to the west of the proposed Sites Reservoir footprint, but Jepson's milkvetch was not found during Project surveys in that area.

Ferris' milk-vetch (*Astragalus tener* var. *ferrisiae*)

Ferris' milk-vetch is a CNPS List 1B species, considered to be "fairly endangered in California." This delicate annual herb in the legume family (Fabaceae) grows from 2.5 to 11 inches tall, flowers from mid-March to May, and is endemic to California. Its habitat consists of vernally moist meadows and weakly alkaline flats on valley grasslands at elevations below 246 feet (75 meters) (CNPS, 2010). It has been found in adobe clay soils of rice fields, fallow pastures, and other low valley sites (Oswald, 2002). Most historically occupied habitat has been destroyed by agriculture. Fifteen occurrences of Ferris' milk-vetch have been reported in Solano, Yolo, Colusa, Glenn, and Butte counties in a narrow band 100 miles long (DFG, 2009b). Of these, six are probably extirpated, and others have not been observed recently. One 1884 occurrence is presumed extant (still in existence) in Colusa County. Most of the nine occurrences known to exist are on lands under public ownership in USFWS refuges, or state Wildlife Areas (e.g., Gray Lodge, Butte Sink). Known populations occur within eight miles of the proposed Project features at the Sacramento NWR. The main existing threat to this species has been habitat destruction due to intensive agriculture and overgrazing. Potential habitat for Ferris' milk-vetch exists in the Primary Study Area around Salt Lake (located within the proposed Sites Reservoir footprint), along the route for the proposed Delevan Pipeline, in the proposed Holthouse Reservoir footprint, and possibly adjacent to portions of the GCID Canal. No occurrences of this species were found during Project surveys.

Heartscale (*Atriplex cordulata*)

Heartscale is a CNPS List 1B species, considered to be "fairly endangered in California." This coarse erect annual herb in the goosefoot family (Chenopodiaceae) grows from four to 20 inches tall, flowers from April to October, and is endemic to California. Its habitat includes saline or alkaline soils in alkali meadow, saltbush scrub, and alkali sink communities at elevations below 1,225 feet (375 meters) (CNPS, 2010). It has been found in dry alkaline soils of grassy fields, levees, margins of seasonally flooded marshes, and other low valley sites. Sixty-three occurrences of heartscale have been reported in Central Valley counties from Kern north to Solano, with isolated occurrences in Glenn and Butte counties (DFG, 2009b). Most are presumed extant. These sites are on lands under federal ownership in USFWS refuges, in state Wildlife Areas, other agency preserves, and private and unknown ownership. Known populations occur within six miles of the Primary Study Area at the Sacramento NWR (Oswald, 2002). The main existing threats to this species have been levee, road, or aqueduct right-of-way maintenance, grazing, development, and invasive weeds. Potential habitat for Heartscale exists in parts of the Primary Study Area around Salt Lake, along the route for the proposed Delevan Pipeline, in the proposed Holthouse Reservoir footprint, and possibly along portions of the GCID Canal. No occurrences of this species were found during Project surveys.

Brittlescale (*Atriplex depressa*)

Brittlescale is a CNPS List 1B species, considered to be "fairly endangered in California." This low-growing annual herb in the goosefoot family (Chenopodiaceae) grows from two to eight inches tall, has sprawling partially prostrate stems, flowers from May to October, and is endemic to California. Its habitat consists of saline or alkaline soils in alkali meadow, saltbush scrub, and alkali sink communities at elevations below 1,050 feet (320 meters) (CNPS, 2010). It has been found in dry alkaline clay soils of grassy fields, levees, margins of seasonally flooded marshes, and other low valley sites. Fifty-six occurrences of brittlescale have been reported in the Central Valley from Glenn County south to Kern County in a narrow band approximately 300 miles long by 20 miles wide (DFG, 2009b). Most known occurrences are presumed to still exist, but at least 15 have not been confirmed recently. Known sites are on lands under federal ownership in USFWS refuges, in state Wildlife Areas, other agency preserves, and private and unknown ownership. The main existing threats to this species have been levee, road, or aqueduct right-of-way maintenance, grazing, agriculture, development, and invasive weeds. Known populations occur within one to three miles of project features, on the Delevan NWR (Oswald, 2002), and other sites now under intensive agriculture. Potential habitat exists in parts of the Primary Study Area around Salt Lake, along the route for the proposed Delevan Pipeline, in the proposed Holthouse Reservoir footprint, and possibly along portions of the GCID Canal. Three occurrences of brittlescale were found during Project surveys: two in the vicinity of (but not within) the proposed Delevan Pipeline construction disturbance area, and one to the east of the proposed Holthouse Reservoir Complex.

San Joaquin spearscale *(Atriplex joaquiniana)*

San Joaquin spearscale is a CNPS List 1B species, considered to be "fairly endangered in California." This stiffly erect annual herb in the goosefoot family (Chenopodiaceae) grows from four to 40 inches tall, flowers from April to October, and is endemic to California. Its habitat consists of strongly saline or alkaline soils in alkali meadow, saltbush scrub, and alkali sink communities at elevations below 1,050 feet (320 meters) (CNPS, 2010). It has been found in dried vernally wet alkaline clay soils of grassy fields, levees, margins of seasonally flooded marshes, and other low valley sites. Ninety-one occurrences of San Joaquin spearscale have been reported along the west edge of the Central Valley and the inner Coast Range margin, from Glenn County south to Kern County in a loose band approximately 300 miles long by five to 25 miles wide (DFG, 2009b). Most known occurrences are presumed to still exist, but at least 12 have not been confirmed since the late 1800s or early 1900s. Known sites are on lands under federal ownership in USFWS refuges, in State Wildlife Areas, other agency preserves, and private and unknown ownership. The main existing threats to this species have been grazing, agriculture, development, and road maintenance. Known populations occur within one to three miles of Project features, on the Sacramento NWR (Oswald, 2002), and other sites now under intensive agriculture. Potential habitat exists in parts of the Primary Study Area around Salt Lake, along the route for the proposed Delevan Pipeline, in the proposed Holthouse Reservoir footprint, and possibly along portions of the GCID Canal. One occurrence of San Joaquin spearscale was found during Project surveys in the vicinity of (but not within) the proposed Delevan Pipeline construction disturbance area; inspection of 2009 aerial photos indicates that this occurrence may have been extirpated due to recent conversion to intensive agriculture.

Vernal pool smallscale *(Atriplex persistens)*

Vernal pool smallscale is a CNPS List 1B species, considered to be “fairly endangered in California.” This coarse erect annual herb in the goosefoot family (Chenopodiaceae) flowers from June to October. It is found only in large alkaline vernal pools at elevations from 30 to 375 feet (10 to 115 meters) (CNPS, 2010). There are 33 occurrences recorded for vernal pool smallscale, scattered in the Central Valley from Glenn County to Tulare County (DFG, 2009b). Most occurrences are thought to still exist. Existing threats to this species include agriculture and flood control activities. The largest concentration, 11 occurrences, is on the Sacramento NWR in Glenn County, approximately three miles north of the proposed Delevan Pipeline. Potential habitat exists in parts of the Primary Study Area around Salt Lake, in the proposed Holthouse Reservoir footprint, along the route for the proposed Delevan Pipeline, and possibly along portions of the GCID Canal. No occurrences of vernal pool smallscale were found during Project surveys.

Big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*)

Big-scale balsamroot is a CNPS List 1B species, considered to be “fairly endangered in California.” This herbaceous perennial in the sunflower family (Asteraceae) grows from a coarse woody rootstock, with basal leaves and several flowering stems four to 16 inches tall. It flowers from March to June, and is found on rocky slopes with chaparral and in foothill woodland and grasslands, often on serpentine substrates from 300 to 4,600 feet (90 to 1,400 meters) elevation (CNPS, 2010). There are 25 occurrences recorded for Big-scale balsamroot, scattered in the Coast Ranges from Tehama County in the North Coast Ranges south to Santa Clara County in the South Coast Ranges, and in the Sierra Nevada foothills from Butte County to Mariposa County (DFG, 2009b). Most occurrences are thought to still exist. The populations nearest to the Primary Study Area are 7.5 miles to the southwest of the proposed Sites Reservoir footprint on serpentine substrate along Walker Ridge. Potential habitat exists in the canyons along the western edges of the Primary Study Area, but no occurrences of this species were found during Project surveys.

Round-leaved filaree (*California macrophylla*)

Round-leaved filaree, a recent addition to CNPS List 1B, is considered to be “seriously endangered in California”. At the time of Project surveys, this species was on List 2 and considered to be “rare or endangered in California but more common elsewhere.” This species is identified as *Erodium macrophyllum* in The Jepson Manual (Hickman, 1993). This low-growing annual to biennial forb in the geranium family (Geraniaceae) grows up to six inches tall, and blooms from March through May. Flowers and fruits are needed for identification to distinguish Round-leaved filaree from look-alike relatives. It is found in heavy clay soils in open foothill savannas and grasslands from 50 to 3,900 feet

(15 to 1,200 meters) elevation (CNPS, 2010). Prior to the start of Project field surveys, Round-leaved filaree was known from 74 occurrences in an extensive California range throughout most Coast Range counties, from southern Tehama County to the Mexican border. As of 2009, it is known from 115 occurrences statewide (DFG, 2009b). However, many occurrences are historic, on private lands, and have not been confirmed for decades. Grazing, urbanization, habitat alteration, vehicles, pipeline construction, feral pigs, and invasive weeds are the main existing threats to this species (CNPS, 2010). Prior to Project surveys, the nearest confirmed occurrence was 30 miles south of the Primary Study Area; three others to the north and east date to the early 1900s. One new occurrence of Round-leaved filaree was found during Project surveys in the hills immediately west of the proposed Sites Reservoir. Potential habitat for this species is common in that area.

Pink creamsacs (*Castilleja rubicundula* ssp. *rubicundula*)

Pink creamsacs is a CNPS List 1B species, considered to be "fairly endangered in California." This small, but showy, annual herb in the figwort family (Scrophulariaceae) flowers from April to June. It is found in annual grassland, sometimes associated with seeps and ponds, and with chaparral in foothill woodlands from 65 to 3,000 feet (20 to 900 meters) elevation (CNPS, 2010). There are 18 occurrences recorded for Pink creamsacs, scattered around the grasslands and foothills in and around the Sacramento Valley in Butte, Shasta, Glenn, Colusa, Lake, and Napa counties, with an outlier population 175 miles south of the Primary Study Area in southern Santa Clara County (DFG, 2009b). Most occurrences are thought to still exist. Existing threats to this species include grazing, mining, vehicles, and road construction. The populations nearest to the Primary Study Area are four to eight miles west of the proposed Sites Reservoir. Potential habitat for Pink creamsacs exists in many locations of the Primary Study Area, but no occurrences of this species were found during Project surveys.

Pappose tarplant (*Centromadia parryi* ssp. *parryi*)

Pappose tarplant, a recent addition to CNPS List 1B, is considered to be "fairly endangered in California." This species is identified as *Hemizonia parryi* ssp. *parryi* in The Jepson Manual (Hickman, 1993). This coarse annual herb in the sunflower family (Asteraceae) flowers from May to November. It is found in seeps, springs, and other vernally wet places, often alkaline, in valley and foothill grasslands, coastal prairie, and chaparral from 6 to 1,400 feet (2 to 420 meters) elevation (CNPS, 2010). Pappose tarplant is known from 23 occurrences scattered through the southern Sacramento Valley, southern North Coast Ranges, and in the San Francisco Bay region (DFG, 2009b). Approximately half of the occurrences are in Solano County. There is one occurrence each in Butte, Glenn, and Lake counties. All of the occurrences are thought to still exist. Threats to pappose tarplant include agriculture, competition, development, grazing, habitat disturbance, and road maintenance. Prior to surveys conducted for this Project, the populations nearest to the Primary Study Area were 7.5 miles west and 17.5 miles southwest of the proposed Sites Reservoir footprint, and 12 miles east of the proposed Delevan Pipeline Intake Facilities on the Sacramento River. One new occurrence was discovered during Project surveys, the first for Colusa County, in the vicinity of (but not within) the proposed Delevan Pipeline route, between the GCID and T-C canals. Potential habitat for pappose tarplant exists around Salt Lake, along the route for the proposed Delevan Pipeline, in the proposed Holthouse Reservoir footprint, and possibly adjacent to some of the GCID Canal, but no other occurrences of this species were found during Project surveys.

Stony Creek spurge (*Chamaesyce ocellata* ssp. *rattanii*)

Stony Creek spurge is a CNPS List 1B species, considered to be "fairly endangered in California." This flat mat-forming annual forb in the spurge family (Euphorbiaceae) grows one to three inches tall, flowers from May to October, and is endemic to California. It is found in openings in grassland and chaparral from 280 to 2,600 feet (85 to 800 meters) elevation (CNPS, 2010), mostly on Lodo shale substrates, but also on creek gravels. Twenty-five occurrences have been recorded for Stony Creek spurge, tightly clustered only in Tehama and Glenn counties (DFG, 2009b). Most occurrences are presumed to still exist. Occurrences nearest the Primary Study Area are more than 10 miles to the northwest, near Stony Gorge Reservoir. Twelve new occurrences of Stony Creek spurge were found during Project surveys in the Newville vicinity, approximately 35 miles north of the Primary Study Area. No potential habitat for Stony Creek spurge exists in the Primary Study Area.

Dwarf soaproot (*Chlorogalum pomeridianum* var. *minus*)

Dwarf soaproot is a CNPS List 1B species, considered to be "fairly endangered in California." This herbaceous perennial member of the lily family (Liliaceae) sends up new leaves and a flowering stem each year from an underground bulb. It flowers from May to August. Dwarf soaproot is found with chaparral on serpentine substrates within oak woodlands and foothill grasslands from 1,000 to 3,300 feet (305 to 1,000 meters) elevation (CNPS, 2010). There are 18 occurrences, 14 of them in the North Coast Ranges and the other four occurrences 250 miles to the south in the South Coast Ranges of San Luis Obispo County (DFG, 2009b). All occurrences are thought to still exist. The populations nearest to the Primary Study Area are seven miles to the west on serpentine substrate southeast of East Park Reservoir. There is no serpentine substrate within the Primary Study Area. Although the plant communities supporting dwarf soaproot exist in many parts of the Primary Study Area, no occurrences of this species were found during Project surveys.

Deepscarred cryptantha *(Cryptantha excavata)*

Deepscarred cryptantha is a CNPS List 1B species. It is considered to be "not very endangered in California" despite being known from five or fewer occurrences, four of which date back to the early 1900s. This annual member of the borage family (Boraginaceae) grows to three to 12 inches tall, with few to several branches. It flowers in April and May. Deepscarred cryptantha is found in sandy crumbly shale or gravelly non-serpentine soil, within foothill oak woodlands, sometimes on dry streambanks, from 300 to 1,500 feet (100 to 500 meters) elevation (CNPS, 2010). This species occurs in the inner North Coast Ranges in Colusa, Lake, Mendocino, and Yolo counties (CNPS, 2010). There are three occurrences in Colusa and Mendocino counties (DFG, 2010a). All occurrences are thought to still exist; however, they were last seen in the late 1800s, or 1968 (most recent). There are five specimens that are known to exist: one specimen from 1903 in Yolo County, two from the late 1800s from Lake County, and two from Colusa County (U.C. Consortium, 2011). Of the two specimens from Colusa County, one 1968 collection is from near Wilbur Springs; the other is a late 1800s Katherine Brandegee collection from "Stites, Colusa Co.". This location may be at Stites Spring, southeast of East Park Reservoir (DFG, 2010a). If so, it is the population nearest to the Primary Study Area (approximately five miles to the west). Although the plant communities and soils supporting deepscarred cryptantha may exist in many parts of the Primary Study Area, no occurrences of this species were found during Project surveys.

Recurved larkspur (*Delphinium recurvatum*)

Recurved larkspur is a CNPS List 1B species, considered to be "fairly endangered in California." This herbaceous perennial member of the buttercup family (Ranunculaceae) sends up new leaves and a flowering stem each year from a shallow rootstock (although not during some drought years). It flowers from March to June. Recurved larkspur is found in somewhat alkaline areas in grasslands, foothill woodlands, and saltbush scrub at elevations from 10 to 2,460 feet (3 to 750 meters) (CNPS, 2010). There are 79 reported occurrences, the vast majority of which are from the San Joaquin Valley and the adjacent South Coast Ranges (DFG, 2010a). In the Sacramento Valley, there is one occurrence each reported from Butte, Glenn, and Colusa counties. Most occurrences are thought to still exist, although many of them have not been re-visited for many years. In the Sacramento Valley, the Butte County site is considered to be extirpated. The other locations were last seen in the 1930s to 1940s. Existing threats to the species include agricultural conversion and grazing. The populations of recurved larkspur nearest to the Primary Study Area are 13 miles south of the Primary Study Area near the southernmost end of Antelope Valley. Potential habitat may be found in the Primary Study Area in low-lying alkaline areas, especially along the route for the proposed Delevan Pipeline, and possibly in the proposed Holthouse Reservoir footprint. No occurrences of this species were found during Project surveys.

Norris' beard-moss (*Didymodon norrissii*)

Norris' beard-moss is a CNPS List 2 species, considered to be "fairly endangered in California" although more widely distributed outside California. This moss is a member of the family Pottiaceae, and grows on rocks, outcrops, fields and cliffs. Norris' beard-moss has been found on serpentine substrates and basalt rock surfaces in intermittently moist open grassland, in grassy openings in oak woodland, conifer forest, and chaparral, at elevations from 600 to 4,500 feet (200 to 1,500 meters) (USDA, 2008). There are 40 occurrences of this taxon, known from several counties throughout California, including Colusa and Lake counties (DFG, 2010a). The nearest known occurrence is from serpentine rock at the head of Doyle Canyon, approximately 12 miles southwest of the Primary Study Area. Suitable non-serpentine habitat probably occurs in scattered woodland sites in the west edge of the Primary Study Area. However, this taxon had not yet been reported from within the Project vicinity, so was not included in 1998 to 2002 Project surveys.

Brandegee's eriastrum *(Eriastrum brandegeeae)*

Brandegee's eriastrum is a CNPS List 1B species, considered to be "fairly endangered in California." This small upright annual forb in the phlox family (Polemoniaceae) grows from two to 12 inches tall, blooms from April through August, and is endemic to California. It is found mainly in dry Lodo shale/decomposing mudstone transition soils, but also in gravelly greenstone, volcanic, and serpentine-derived soils from 1,000 to 3,300 feet (305 to 1,030 meters) elevation (CNPS, 2010). Habitat consists of very sparse dry open foothill pine/chaparral vegetation. Its appearance is very similar to other uncommon and co-occurring members of its genus. Prior to Project field studies, Brandegee's eriastrum was known to occur in a restricted range at the eastern edge of the inner Coast Range, consisting of 47 occurrences in a band approximately 120 miles long and 10 to 15 miles wide, from the junction of Shasta, Trinity and Tehama counties to Lake County, with one disjunct (distantly separated) occurrence in Santa Clara County (DFG, 2009b). Abundance within occurrences varies widely from a few individuals to several hundred or 1,000 individuals. Approximately half of known occurrences are on federal (BLM or Mendocino National Forest) land and half are on private lands. Grazing, road work, and development are the main existing threats to this species. Prior to Project surveys, the nearest known occurrences were five to six miles west of the proposed Sites Reservoir. Three new occurrences of Brandegee's eriastrum were found during 2001 to 2002 surveys in the Newville area, approximately 35 miles north of the Primary Study Area. No occurrences or potential habitat for Brandegee's eriastrum exist in the Primary Study Area.

Tracy's eriastrum *(Eriastrum tracyi)*

During Project surveys, Tracy's eriastrum was considered to be the same species as Brandegee's eriastrum, and has only very recently been classified as a separate species (U.C., 2001). The discussion of Brandegee's eriastrum also applies to Tracy's eriastrum.

Snow Mountain buckwheat *(Eriogonum nervulosum)*

Snow Mountain buckwheat is a CNPS List 1B species, considered to be "fairly endangered in California." This annual herb in the buckwheat family (Polygonaceae) flowers from June to September. It is found on dry serpentine outcrops and other barren stony sites in chaparral, from 980 to 7,000 feet (300 to 2,105 meters) elevation (CNPS, 2010). There are 12 known occurrences of Snow Mountain buckwheat scattered through Colusa, Lake, Sonoma, and Yolo counties (DFG, 2009b). Eleven of these occurrences are thought to still exist. Existing threats to this species include energy development, mining, and vehicles. The occurrences nearest to the Primary Study Area are seven miles to the west. There is no serpentine substrate within the Primary Study Area, although the plant communities supporting Snow Mountain buckwheat exist in many parts of the Primary Study Area. No occurrences of this species were found during Project surveys.

Diamond-petaled California poppy *(Eschscholzia rhombipetala)*

Diamond-petaled California poppy is a CNPS List 1B species, considered to be "seriously endangered in California." This annual herb in the poppy family (Papaveraceae) flowers from March to April. It is found on clay slopes and flats of valley and foothill grasslands, often somewhat alkaline, from zero to 3,200 feet (zero to 975 meters) elevation (CNPS, 2010). Diamond-petaled California poppy has a scattered distribution, with occurrences in Colusa County in the north, Contra Costa, Alameda, San Joaquin, and Stanislaus counties in the central part of its range, and in San Luis Obispo County to the south. There are 10 occurrences, all of which are considered to still exist (DFG, 2010a). Diamond-petaled California poppy is listed as extirpated in Colusa County, as well as in Contra Costa and Stanislaus counties (CNPS, 2010). Existing threats to Diamond-petaled California poppy include agriculture and grazing. Potential habitat exists in many parts of the Primary Study Area, but no occurrences of this species were found during Project surveys.

Adobe lily (*Fritillaria pluriflora*)

Adobe Lily is a CNPS List 1B species, considered to be "fairly endangered in California." This perennial bulb-forming herb in the lily family (Liliaceae) grows from five to 16 inches tall, blooms from February through April, and is endemic to California. It is found in heavy clay soils, in open grassland, and at semi-shaded blue oak/foothill pine/chaparral woodland edges, at elevations from 200 to 2,300 feet (60 to 705 meters) (CNPS, 2010). Prior to Project surveys, Adobe Lily was known to occur in a restricted range of 97 occurrences in narrow bands along the west and east sides of the Sacramento Valley, from Tehama County to Solano County on the west side, and from Tehama County to Butte County on the east side (DFG, 2010a). Abundance within occurrences varies widely from a few individuals to several hundred or 1,000 individuals. Several known occurrences are on federal (BLM or USFS) land or preserves (TNC Vina Plains), but most are on private lands. Grazing, road work, and off-road recreation are the main threats to this species. Prior to Project surveys, the nearest known occurrences of Adobe Lily were four miles west of the Primary Study Area. Eighteen new occurrences of adobe lily were found during Project surveys, with five occurring at the west edge of the Primary Study Area, and the remaining 13 occurrences located farther north in the Newville area (northern Glenn County and southern Tehama County). Potential habitat for adobe lily exists in the hills to the west of the proposed Sites Reservoir footprint.

Hall's harmonia (*Harmonia hallii*)

Hall's harmonia is a CNPS List 1B species, considered to be "seriously endangered in California." This annual herb in the sunflower family (Asteraceae) flowers from April to June. This species is identified as *Madia hallii* in The Jepson Manual (Hickman, 1993). It is found on serpentine soils, in openings in chaparral, from 1,600 to 3,000 feet (500 to 900 meters) elevation (CNPS, 2010). Hall's harmonia is known from 16 occurrences, from within a 250-square-mile area of the North Coast Ranges in Colusa, Lake, Napa, and Yolo counties (DFG, 2010a). All occurrences are thought to still exist. Existing threats to the species include mining activities. The occurrences of Hall's harmonia nearest to the Primary Study Area are 6.5 miles to the southwest on Walker Ridge. There is no serpentine substrate within the Primary Study Area, although the plant communities supporting Hall's harmonia exist along the western parts of the Primary Study Area. No occurrences of this species were found during Project surveys.

Drymaria-like western flax *(Hesperolinon drymarioides)*

Drymaria-like western flax is a CNPS List 1B species, considered to be "fairly endangered in California." This delicate annual herb in the flax family (Linaceae) flowers from May to August. It is found on serpentine soils, mostly within chaparral, and within foothill woodlands and grasslands from 320 to 3,700 feet (100 to 1,130 meters) elevation (CNPS, 2010). Drymaria-like western flax is known from 20 occurrences in the inner North Coast Ranges of Colusa, Glenn, Lake, Napa, and Yolo counties (DFG, 2010a). All occurrences are thought to still exist. Existing threats to the species include mining and vehicles. The occurrences of drymaria-like western flax nearest to the Primary Study Area are seven miles to the west along Walker Ridge. There is no serpentine substrate within the Primary Study Area, although the plant communities supporting drymaria-like western flax exist along the western parts of the Primary Study Area. No occurrences of this species were found during Project surveys.

Woolly rose-mallow or California hibiscus *(Hibiscus lasiocarpos* ssp. *occidentalis)*

Woolly rose-mallow or California hibiscus, a recent addition to CNPS List 1B (Hill, 2011), is considered to be "fairly endangered in California." This herbaceous perennial member of the mallow family (Malvaceae) sends up clusters of new stems three to six feet tall each year from underground rhizomes. It flowers from June to September, but plants can generally be recognized much of the year. It is found on wet banks of streams and freshwater marshes from zero to 400 feet (zero to 120 meters) elevation (CNPS, 2010). Woolly rose-mallow or California hibiscus is known from 134 occurrences in California, in low-lying areas of the Central Valley from Butte County to San Joaquin County (DFG, 2010a). Most of the occurrences are concentrated in the northern and southern ends of the range. All California occurrences are thought to still exist. Existing threats to this sub-species include development, agriculture, recreation, and channelization of the Sacramento River and its tributaries. Occurrences of woolly rose-mallow or California hibiscus nearest to the Primary Study Area are along the Sacramento River and along Butte Creek five miles east of the proposed Delevan Pipeline Intake Facilities. One occurrence has also been found in the Sacramento NWR, five miles north of the proposed Delevan Pipeline route (Oswald, 2002). Potential habitat exists in the Primary Study Area in wet low-lying areas, but no occurrences of this species were found during Project surveys.

Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)

Coulter's goldfields is a CNPS List 1B species, considered to be "seriously endangered in California." This short annual herb in the sunflower family (Asteraceae) flowers from February to June. It is found in vernal pools and other vernally wet places, including coastal salt marshes in southern California from 3 to 4,000 feet (1 to 1,220 meters) elevation (CNPS, 2010). Coulter's goldfields is known from 66 occurrences; 65 are located in the southern third of California (DFG, 2010a). The one northern California occurrence, in Colusa County, is represented by two collections from 1917 and 1926 from alkali plains west of Colusa (DFG, 2011); the species has not been seen in Colusa County since, though it is thought to still exist. One occurrence is reported (for 1987) from The Nature Conservancy's Vina Plains Preserve in Tehama County (CalFlora, 2011). Approximately half of the occurrences in southern California have been extirpated by the growth of the metropolitan areas in the Los Angeles basin and in Bakersfield. Threats to the species include urbanization and agricultural development. The species is known to have declined significantly by 1966 (CNPS, 2010). The Colusa County location of Coulter's goldfields is 10 miles south of the proposed Delevan Pipeline route; therefore, potential habitat may exist in parts of the Primary Study Area along the route for Delevan Pipeline, and possibly in the proposed Holthouse Reservoir footprint; however, no occurrences were found during Project surveys in these areas.

Colusa layia (*Layia septentrionalis*)

Colusa layia is a CNPS List 1B species, considered to be "fairly endangered in California." This short annual herb in the sunflower family (Asteraceae) flowers in April and May. It is found in chaparral, oak woodlands, and valley and foothill grasslands, often on serpentine substrates, from 325 to 3,600 feet (100 to 1,095 meters) elevation (CNPS, 2010). Colusa layia is known from 44 occurrences, most of which are scattered in the inner North Coast Ranges from Tehama County to Napa County, with a couple of isolated Sacramento Valley sites in Colusa and Sutter counties (DFG, 2010a). Almost all occurrences are thought to still exist, although one-third of them have not been re-visited in over 50 years, including the two sites in the Sacramento Valley. The main existing threat to the species is development. The two occurrences of Colusa layia nearest to the Primary Study Area are four to six miles to the west, around East Park Reservoir and by the Sites Lodoga Road west of Grapevine Pass. Potential habitat exists in many parts of the Primary Study Area, but no occurrences of this species were found during Project surveys.

Heckard's pepper-grass (*Lepidium latipes* var. *heckardii*)

Heckard's pepper-grass is a CNPS List 1B species, considered to be "fairly endangered in California." This short annual herb in the mustard family (Brassicaceae) flowers from March through May. It is found in alkaline flats in valley and foothill grasslands from 30 to 650 feet (10 to 200 meters) elevation (CNPS, 2010). Heckard's pepper-grass is known from 11 Sacramento Valley occurrences, in Glenn, Solano, and Yolo counties (DFG, 2010a). All occurrences are thought to still exist. All of the Glenn County occurrences are on the Sacramento NWR, four miles north of the proposed Delevan Pipeline route. Potential habitat exists in the Primary Study Area in low-lying areas, especially along the route for the Delevan Pipeline, and possibly in the proposed Holthouse Reservoir footprint; however, no occurrences of this species were found during Project surveys.

Red-flowered lotus *(Lotus rubriflorus)*

Red-flowered lotus is a federal Species of Special Concern and a CNPS List 1B species, considered to be "seriously endangered in California." This low-growing small annual herb in the legume family (Fabaceae) grows up to four inches tall, blooms from April through June, and is endemic to California. It is found mostly in vernally moist heavy clay soils, at blue oak/foothill pine/chaparral-grassland edges at elevations from 650 to 1,400 feet (200 to 425 meters) (CNPS, 2010). Red-flowered lotus is known from only four widely-separated occurrences in the low foothills off the west edge and northeast edge of the Sacramento Valley in Tehama, Colusa, and Stanislaus counties (DFG, 2010a). Abundance within these occurrences varies from a few to thousands of individuals. All known occurrences are on private lands or utility corridors. Development, grazing, and invasive weeds are the main existing threats to this species.

Prior to Project surveys, the nearest known occurrences of red-flowered lotus were approximately seven miles west of the Primary Study Area. Eight new occurrences of red-flowered lotus were found during 2001 to 2002 surveys, with six occurrences near the west edge of the Primary Study Area and two occurrences in the Newville area, approximately 35 miles north of the Primary Study Area (southwest Tehama County). These sites fill a major distribution gap for this species and triple the number of known occurrences. Potential habitat for red-flowered lotus is common in the hills to the west of the proposed Sites Reservoir footprint.

13.2.3.4 Vegetation Communities

The Primary Study Area falls within the Jepson Manual's "Inner North Coast Range" geographic subdivision of the California Floristic Province (Hickman, 1993), as well as the western edge of the "Sacramento Valley" subdivision of the Manual's Great Valley floristic region.

Vegetation communities are described as they typically occur over much of the northern half of California, where vegetation is strongly influenced by precipitation, temperature, soils, aspect, slope, disturbance history, and elevational changes. This area is characterized by a Mediterranean climate of hot dry summers and moderately cold wet winters. Approximately 95 percent of the annual precipitation occurs during the winter months and is influenced by the "rain shadow" of the North Coast Ranges along the west edge of the Primary Study Area. Soils of mainly marine-sedimentary origin also influence vegetation patterns within the Primary Study Area.

Localized sites in the foothills support fire-dependent stands of chamise chaparral, as well as more diverse mixed chaparrals. Unique habitats that support specialized plant associations include the vernal pools and swales found on valley floors or clay terraces, and low-elevation saline/alkaline flats. Unique plant associations adapted to certain soil types include the endemic serpentine floras (sets of plants restricted to serpentine substrates) found mostly in lower Coast Range slopes immediately west of the Primary Study Area, but also occasionally found on Lodo shale and other crumbly shale in the lower foothills within the Primary Study Area. Bear Valley, which is situated between the foothills in western Colusa County just south of the Primary Study Area, supports spring wildflower displays on its partly serpentinite-derived alluvium.

Vegetation communities in the vicinity of the Primary Study Area vary from riparian forest/scrub along the Sacramento River and its tributaries to mainly agricultural lands and occasional annual grass/forbland in the Sacramento Valley. Further west are blue oak savanna or woodland on the low foothills and mixed oak/gray pine/ chaparral shrub communities in the lower slopes of the Coast Range, and finally transitioning into mixed conifer forest in the upper Coast Range elevations.

Vegetation communities mapped on land surrounding proposed Project features include five natural vegetative community types and one non-native community Natural communities include grassland, chaparral/shrubland, blue oak woodland, valley oak woodland, and riparian forest/woodland; agriculture comprises the non-native community. These broad communities contain 12 more specific plant associations, or vegetation types (Figure 13-2); also mapped were other land cover types, such as canals, ponds, and urbanized areas. Unique habitats supporting specialized plant associations include the vernal pools and swales found on valley floors or clay terraces, and low- elevation saline/alkaline flats. These are mapped as part of the grassland community (also refer to Chapter 15 Wetlands and Other Waters of the U.S. addressing wetlands, such as vernal pools or alkaline wetlands). Unique plant associations adapted to certain soil types include the endemic serpentine floras (sets of plants restricted to serpentine substrates) found mostly in lower Coast Range slopes, but these species also occasionally occur on the Lodo shale and other crumbly shales in the lower foothills, especially as part of the chaparral/shrubland community. No serpentine soils or flora are located within the Primary Study Area; soils derived from shale are found on some of the hillslopes in the Primary Study Area.

Grassland

The mapping unit termed "Annual grassland" corresponds roughly to the "California Annual Herbland" alliance in Sawyer et al. (2009), with some elements of Associations dominated by brome *(Bromus)* and wild oats *(Avena)*. Annual grassland best fits the description for the Annual Grassland (AGS) WHR habitat type. It is typically dominated by introduced (non-native) annual grass species, such as wild oats (*Avena* spp.), barleys (*Hordeum* spp.), and ryegrass (*Lolium* spp.), with a small minority (less than 15 percent relative cover) of native perennial species. This vegetation community also supports areas of native herbaceous spring annuals, sometimes called "wildflower fields," and native perennial bunchgrasses, such as hook three-awn (*Aristida ternipes* ssp. *hamulosa*) or needlegrass (*Nassella* spp.). Trees comprise less than 10 percent total cover, with occasional small groupings or individuals of valley or blue oaks. Areas dominated by noxious weeds, such as yellow star-thistle (*Centaurea solstitialis*), are common. The annual grassland vegetation community dominates valley bottomlands and rolling hills immediately adjacent to the valleys. It can make a slow transition into adjacent wooded areas by forming a mosaic, occurring as understory in open oak savanna, or can transition abruptly to woodland. Within the grassland vegetation type, vernal pools and swales occurring over clay hardpans, or vernally moist saline or alkaline soils on the valley floor, may support unique native floras that sometimes include several distinctive special-status plant species. Annual grassland comprises 45 percent of the mapped vegetation in the Primary Study Area (Figure 13-2), and approximately 75 percent of the Project's construction disturbance area (Table 13-6). Annual grassland is common throughout California; this community in the Primary Study Area represents less than 1 percent of the state's annual grasslands.

Area vegetated by annual grassland can vary over the years as more or less acreage is converted to agriculture within the Primary Study Area. For example, in the 12 years between the 1997 aerial imagery used for Project vicinity mapping and the 2009 National Agricultural Imagery Program (NAIP) imagery, over 200 acres of grassland were converted to agriculture (all dryland grain) inside the proposed Sites Reservoir footprint area, and approximately 1,000 acres outside of the proposed Sites Reservoir (northeast of Funks Reservoir) were converted, mostly to dryland grain, and also to rice, orchards, and irrigated fields (DWR, 2004).

Table 13-6
Vegetation Types within the Primary Study Area

Vegetation Type	Acreage	
	Primary Study Area[a]	Percent of Primary Study Area Total
Annual grassland	14,765.0	75.4
Alkaline wetland	14.0	0.1
Blue oak woodland	831.5	4.2
Blue oak savanna	645.9	3.3
Blue oak/Mixed chaparral	54.5	0.3
Canal	22.4	0.1
Chamise	2.5	0[b]
Crops/agriculture	2,964.8	15.1

Table 13-6
Vegetation Types within the Primary Study Area

Vegetation Type	Acreage	
	Primary Study Area[a]	Percent of Primary Study Area Total
Fremont Cottonwood riparian	1.1	0.0[b]
Freshwater marsh	4.5	0.0[b]
Open water	1.6	0.0[b]
Mixed Chaparral	2.6	0.0[b]
Ponds	28.8	0.2
Urban/Disturbed	136.8	0.7
Valley-foothill riparian	86.0	0.5
Valley oak riparian	26.5	0.1
Valley Oak Woodland	3.5	0.0[b]
TOTAL	**19,592.0**	**100**

[a]The Primary Study Area includes the proposed Alternative C facility footprints, and the construction disturbance area for the Road Relocations, Delevan Transmission Line, Delevan and TRR pipelines, TRR to Funks Creek Pipeline, Holthouse to T-C Canal Pipeline, and GCID Canal Facilities Modifications. This total does not include acreage occupied by existing facilities, namely Funks Reservoir and the GCID Canal, or other proposed facilities that include no affected natural vegetation communities.

[b]Represents less than 0.1 percent of total.

Chaparral/Shrubland

Shrub-dominated vegetation communities consist mainly of chaparral types that are either dominated by chamise (*Adenostoma fasciculatum*) or that are a mixed chaparral composed of a diverse assemblage of species such as manzanita (*Arctostaphylos* spp.), buckbrush (*Ceanothus cuneatus*), scrub oak (*Quercus berberidifolia*), and poison oak (*Toxicodendron diversilobum*). Both vegetation types are sometimes found with an overstory of sparsely scattered blue oaks and/or gray pines. The chamise type usually occurs as nearly pure stands or with a minor component of buckbrush, and is found in small and large patches in the Coast Range foothills at the west edge of the Primary Study Area. Mixed chaparral is also sporadically distributed in the low foothills at the western edge, but is more common among the higher wooded hills farther to the west. Both types are often interspersed within a mosaic of blue oak woodlands and grassland openings. On substrates of decomposing shale, the mixed chaparral community occasionally includes some California juniper (*Juniperus californicus*) and may contain several special-status plant species. The chamise vegetation type comprises four percent of the vegetation mapped around the Primary Study Area (Figure 13-2), and less than one percent of the state's patchy, but extensive, chamise shrubland. Mixed chaparral accounts for approximately one percent of vegetation mapped around the Primary Study Area. Both types of chaparral/shrublands occupy less than one percent of the Project's construction disturbance area. Such non-chamise-dominated chaparral shrublands are not rare in the state, but are distributed in bands and discontinuous patches that vary in species composition geographically. This vegetation within the Primary Study Area represents less than one percent of the state's mixed chaparral shrublands.

Blue Oak Woodland

The blue oak woodland vegetation community, dominated by blue oak (*Quercus douglasii*), is the most common vegetation in the low foothills in the western portion of the Primary Study Area. These woodlands vary from open grassy stands of blue oaks on south facing slopes and ridge tops to moderately to very dense stands of small blue oak trees mixed with interior live oak (*Quercus wislizenii*) on north facing slopes. In the low foothills, the woodlands can also include some chaparral species and/or an open overstory of sparsely scattered Gray pines (*Pinus sabiniana*). Special-status plant species are sometimes found in clay or crumbly shale soils where grasslands transition into woodlands, or where chaparral shrubs are present as a woodland understory. Weedy areas often contain localized infestations of Italian thistle (*Carduus pycnocephalus*). Approximately 20 percent of the vegetation mapped around the Primary Study Area is blue oak woodland of varying density; more than half of this woodland includes an extensive mixed chaparral understory (Figure 13-2). Blue oak woodland, with and without a chaparral understory, accounts for approximately seven percent of the Project's construction disturbance area (Table 13-6). Blue oak woodland in the Primary Study Area represents one percent of the state's existing blue oak woodlands. Blue oak woodland with gray pine represents less than one percent of the vegetation in the Primary Study Area, and much less than one percent of this vegetation type in the state. The character of blue oak woodland in the Primary Study Area has changed during the 12 years from 1997 to 2009. A comparison of the hillslopes in the 1997 aerial imagery used for mapping the vegetation for this analysis to the same slopes in the 2009 NAIP imagery shows that many acres of moderately dense blue oak woodland have been converted to open grassland or extremely sparse oak savanna, due to cutting for firewood. At least 2,000 acres of mapped vegetation in the Primary Study Area have been affected, located mostly on the hillslopes around the northwest corner of the proposed Sites Reservoir footprint.

Valley Oak Woodland

Valley oak woodland and savanna (dominated by Valley oak (*Quercus lobata*) are occasionally found on stream terraces where the larger creeks emerge from the foothills onto the valley floors. These areas, with scattered large individual trees or with denser stands closer to creeks, are not common or very large in the Primary Study Area. Weedy areas within valley oak woodlands include localized patches of Milk thistle (*Silybum marianum*), Bull thistle (*Cirsium vulgare*), Italian thistle *(Carduus* spp.*)*, or star thistle (*Centaurea* spp.). Some of the valley oak woodlands can be very disturbed by livestock and ranching activities because these operations tend to concentrate in the larger valley bottoms where most of these woodlands are found. No special-status plant species are known from this vegetation community within the region. Valley oak woodlands account for a fraction of one percent of the vegetation mapped around the Primary Study Area and Project construction disturbance area vegetation, and also account for less than one percent of the Valley Oak woodland in the state.

Riparian

Riparian forest or woodland is found intermittently in the Primary Study Area, usually as very narrow strips, with the exception of larger areas along the edges of the Sacramento River. These narrow strips are most frequently found along creeks and near springs higher than the coast range foothills up and away from the valley floors. Riparian vegetation can be dominated by Fremont cottonwood (*Populus fremontii*), occasionally by Valley oak (*Quercus lobata*), by tree willows (*Salix gooddingii*, *S. laevigata*) or shrubby willows (*S. exigua* and others), often with a varied shrub, vine, and herbaceous understory. Most of the patches of riparian habitat within the Primary Study Area (including springs) are small, sparse, and degraded by intensive cattle use. This disturbed riparian habitat does not support special-status plant species. Intermittent creeks across interior valley floors tend to be almost barren or lined by narrow interrupted strips of sparse riparian vegetation. Many of the larger trees along these disturbed creeks are not native, such as walnut (*Juglans* spp.), fig (*Ficus carica*), and tree-of-heaven (*Ailanthus altissima*).

Well-developed multiple-storied native riparian vegetation occurs in small remnant patches along foothill portions of a few of the Primary Study Area's larger creeks, and in a few large patches along the Sacramento River.

The riparian woodland vegetation community comprises less than one percent of the vegetation mapped around the Primary Study Area, and less than one percent of the Project's construction disturbance area. Riparian vegetation communities are not common in the rest of the state relative to other vegetation communities; riparian vegetation within the Primary Study Area represents approximately 0.4 percent of the state's riparian woodlands.

Freshwater Marsh

Marsh (freshwater), or emergent wetland, occurs in two places in the Primary Study Area: in a strip along the northern edge of the Delevan National Wildlife Refuge (NWR), and very infrequently at edges of riparian areas, ponds, or irrigation ditches. Other than the Delevan NWR strip, this community was rarely mapped in the Primary Study Area, due to the extremely small size of marshy sites. Freshwater marsh/emergent wetland is typically dominated by cattails (*Typha* spp.), rushes (*Scirpus* spp.) and sometimes sedges (*Carex* spp.) and spikerush (*Eleocharis* spp.), and often has patchy willow shrubs (*Salix* spp.). The strip of managed wetland along the Delevan NWR boundary consists of both wet and temporarily dry areas, depending on where water is directed. Freshwater marsh accounts for less than one percent of the vegetation mapped around the Primary Study Area and also within the Project's construction disturbance area.

Alkaline Wetland

Alkaline (and probably weakly saline) marsh and wetlands are present at two locations within the Primary Study Area: one parcel north of the Delevan NWR within the Delevan Pipeline construction disturbance area, and a second site located southeast of Funks Reservoir. Alkaline marshes support many of the same species as in freshwater marsh (such as spikerush, rush), but also support a unique flora (such as saltgrass [*Distichlis spicata*]) tolerant of saline and alkaline conditions. These wetlands are a remnant of a much more extensive patchwork of saline/alkaline wetlands that once existed on the Central Valley floor and western edges, and can support several sensitive plant species. Alkaline wetland accounts for less than one percent of the vegetation mapped around the Primary Study Area and also within the Project's construction disturbance area. Wetlands are considered in more detail in Chapter 15 Wetlands and Other Waters of the U.S.

Agriculture

Agriculture accounts for much of the land cover in the Sacramento Valley between the Sacramento River and the Coast Range foothills. In addition, the smaller interior valleys have scattered hayfields, pastures, and small orchards. Crops on larger farms include rice, irrigated grains and row crops, pastures, hayfields, and deciduous orchards. Agricultural lands account for 27 percent of the vegetation around the Primary Study Area, as originally mapped for this Project in 2002. Because this land cover type is so extensive in California, the agricultural lands within the Primary Study Area represent only a fraction of one percent of the state's total agricultural land. Agricultural fields account for approximately 16 percent of the Project's construction disturbance area.

Agricultural land uses contract and expand over time, and the type of crop under cultivation can change in any given year. GIS analysis of the Primary Study Area over 2009 NAIP imagery shows that in the years since vegetation was first mapped for this Project (2002), approximately 200 acres of annual grasslands within the proposed Sites Reservoir footprint have been converted to dryland grain fields. Outside of the proposed Sites Reservoir footprint, more than 1,000 additional acres northeast of Funks Reservoir have been converted from annual grasslands to mostly dryland grain, with smaller acreages of orchard, rice, and irrigated crops.

Vegetation mapped around the Primary Study Area (shown in Figure 13-2) was also analyzed according to distribution within the confines of proposed Project facilities, i.e., “footprints” of land within which all Project-related ground disturbance would occur. The total acreage affected by Project facilities, and the percent that each vegetation type represents of the total Project acreage, are presented in Table 13-6. Acreage totals are based on the largest Project alternative (Alternative C) and reflect baseline conditions. Acreage totals represent a combination of the facility footprints and the defined construction disturbance area for Delevan Pipeline.

Table 13-7 shows the presence of the above vegetation types within the anticipated disturbance areas for proposed Project features.

Table 13-7
Vegetation Types at each Project Facility Location

Project facility	Annual Grassland	Alkaline Wetland	Blue Oak Woodland	Blue Oak Savanna	Blue Oak/Mixed Chapparal	Canal	Chamise	Crops/Agriculture	Fremont Cottonwood Riparian	Mixed Chaparral	Open Water (Stream or River Only)	Ponds	Urban/Disturbed	Valley-Foothill Riparian	Valley Oak Riparian	Valley Oak Woodland
Sites Reservoir and Dams	X		X	X	X			X				X	X	X	X	X
Recreation Areas	X		X	X	X		X					X				
Road Relocations and South Bridge	X		X	X	X	X	X	X		X		X	X	X	X	
Sites Pumping/Generating Plant and Sites Reservoir Inlet/Outlet Structure	X											X	X	X		
Sites Electrical Switchyard	X															
Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure[a]																
Field Office Maintenance Yard	X															
Holthouse Reservoir Complex[b] and Holthouse Reservoir Electrical Switchyard	X	X				X		X			X			X		
GCID Canal Facilities Modifications[c]																
GCID Canal Connection to the TRR						X		X								
Terminal Regulating Reservoir						X		X					X			
TRR Pumping/Generating Plant and TRR Electrical Switchyard								X								
TRR Pipeline and TRR Pipeline Road						X		X								
Delevan Transmission Line[c]	X	X				X		X				X	X	X		
Delevan Pipeline[d] and Delevan Pipeline Electrical Switchyard		X				X		X				X	X			

Table 13-7
Vegetation Types at each Project Facility Location

Project facility	Annual Grassland	Alkaline Wetland	Blue Oak Woodland	Blue Oak Savanna	Blue Oak/Mixed Chapparal	Canal	Chamise	Crops/Agriculture	Fremont Cottonwood Riparian	Mixed Chaparral	Open Water (Stream or River Only)	Ponds	Urban/Disturbed	Valley-Foothill Riparian	Valley Oak Riparian	Valley Oak Woodland
Delevan Pipeline Intake/Discharge Facilities						X		X	X		X		X	X		
Project Buffer	X		X	X	X	X	X	X	X		X		X	X		X

[a]Alkaline wetland in Delevan Pipeline construction disturbance area is now managed as freshwater wetland.
[b]Alkaline wetland in the Holthouse Reservoir footprint is a small part of a continuous 13-acre alkaline wetland extending to the southeast.
[c]These Project facilities disturb only areas within existing structures, so have no 'footprint' on surrounding lands.
[d]Alkaline wetland in the Delevan Pipeline construction disturbance area is managed as freshwater wetland.

13.2.3.5 Invasive Plant Species

Table 13-8 shows that 49 species of noxious weeds either are known to occur in the Primary Study Area because they were found during Project surveys, or are likely to occur there because they have been documented from Glenn or Colusa counties and occur in similar habitats. Twenty-eight of those 49 species have been identified in the Primary Study Area during botanical resource surveys for the Project. Among the species in Table 13-8 are two CDFA "A" species and eight "B" species (the State's weed categories of greatest concern for invading natural areas). Also represented are 12 species of "High" concern and 25 species of "Medium" concern for Cal-IPC in terms of invasiveness. Also included on Table 13-8 are most of the weed species of concern on the lists of the Mendocino National Forest and the local Weed Management Area.

Table 13-8
Noxious Weed Species Known or Likely to Occur in the Primary Study Area

Likely to Occur in Primary Study Area[a]	Common Name *Scientific Name*	CDFA List[b]	Cal-IPC List[c]	Local WMA List[d]	Mendocino NF[e] List	Habitat (Elevation)
H	Barbed Goatgrass *Aegilops triuncialis*	B	H	x	x	Disturbed sites, cultivated fields, roadsides (<1,000 m)
M	Bermuda Buttercup *Oxalis pes-caprae*		M			Disturbed places, grasslands (<500 m)
H	Bermuda Grass *Cynodon dactylon*	C	M			Disturbed sites (<900 m)
H	Black Locust *Robinia pseudoacacia*		L			Roadsides, canyon slopes, stream banks (50 to 1,900 m)

Table 13-8
Noxious Weed Species Known or Likely to Occur in the Primary Study Area

Likely to Occur in Primary Study Area[a]	Common Name *Scientific Name*	CDF A List[b]	Cal-I PC List[c]	Local WMA List[d]	Mendocino NF[e] List	Habitat (Elevation)
M	Broad-Leaved Peppergrass *Lepidium latifolium*	B	H	x		Saline soils, roadsides (<1,900 m)
H	Bull Thistle *Cirsium vulgare*	C	M			Disturbed places (<2,300 m)
H	California Bur-Clover *Medicago polymorpha*		L			Disturbed grasslands (<1,500 m)
M	Canada Thistle *Cirsium arvense*	B	M		x	Disturbed places (<1,800 m)
M	Cheat Grass *Bromus tectorum*		H			Open, disturbed places (<2,200 m)
M	Crispate-Leaved Pondweed *Potamogeton crispus*		M			Shallow water, ponds, reservoirs, streams (<2,100 m)
H	Cutleaf Geranium *Geranium dissectum*		M			Moist disturbed grassy areas (<1,200 m)
M	Dalmation Toadflax *Linaria genistifolia* ssp. *dalmatica*	A	M			Disturbed places, pastures, fields (generally <1,000 m)
H	Edible Fig *Ficus carica*		M			Disturbed, moist areas (<800m)
H	Field Bindweed *Convolvulus arvensis*	C	D			Orchards, gardens (gen <1,500 m)
M	Field Mustard *Brassica rapa* [=*B. campestris*]		L			Fields, disturbed areas (<1,500 m)
M	Five-Horn Bassia *Bassia hyssopifolia*		L			Disturbed sites, fields, roadsides (<1,200 m)
H	Giant Reed *Arundo donax*	B	H	x		Moist places, seeps, ditch banks (<500 m)
H	Hedgehog Dogtail Grass *Cynosurus echinatus*		M			Open disturbed sites (<1,000 m)
H	Himalayan Blackberry *Rubus armeniacus* [= *R. discolor*]		H			Disturbed moist areas (<1,600 m)
H	Italian Thistle *Carduus pycnocephalus*	C	M		x	Roadsides, pastures, waste areas (<1,000 m)
H	Johnson Grass *Sorghum halepense*	C				Disturbed areas, ditch banks, roadsides (<800 m)
H	Jointed Goatgrass *Aegilops cylindrica*	B			X	Disturbed dry sites, cultivated fields (<1500 m)
M	Klamathweed/St. John's-Wort *Hypericum perforatum*	C	M	x	x	Pastures, abandoned fields, disturbed places (<1,500 m)
M	Mediterranean Mustard *Hirschfeldia incana*		M			Roadsides, moist waste places, gravel tailings (<1,600 m)
H	Medusa-Head *Taeniatherum caput-medusae*	C	H	x	x	Grassy slopes and flats (<2,100 m)

Table 13-8
Noxious Weed Species Known or Likely to Occur in the Primary Study Area

Likely to Occur in Primary Study Area[a]	Common Name *Scientific Name*	CDFA List[b]	Cal-IPC List[c]	Local WMA List[d]	Mendocino NF[e] List	Habitat (Elevation)
H	Milk Thistle *Silybum marianum*		L			Roadsides, ditches, pastures, disturbed places (<500 m)
H	Olive *Olea europaea*		L			Disturbed places (<200 m)
M	Pampas Grass *Cortaderia selloana*		H			Disturbed sites (<300 m)
M	Pennyroyal *Mentha pulegium*		M			Moist areas, ditches (<1,000 m)
M	Poison Hemlock *Conium maculatum*		M			Moist, disturbed places (<1,000 m)
M	Puncturevine *Tribulus terrestris*	C				Roadsides, railways, vacant lots, dry, disturbed areas (<100 m)
H	Red Brome *Bromus madritensis* ssp. *rubens*		H			Open, disturbed places (<2,200 m)
H	Ripgut Brome *Bromus diandrus*		M			Open, disturbed places (<2200m)
H	Rose Clover *Trifolium hirtum*		M			Roadsides, fields, disturbed places (<2,060 m)
H	Rough Cat's-Ear *Hypochaeris radicata*		M			Disturbed areas (<500 m)
M	Russian Knapweed *Acroptilon repens*	B	M			Disturbed areas (<1,900 m)
H	Russian Olive *Elaeagnus angustifolia*		M			Disturbed, moist areas (<1500m)
M	Sheep Sorrel *Rumex acetosella*		M			Disturbed moist areas (<3,000 m)
M	Tall Fescue *Festuca arundinacea*		M			Disturbed places (<2,700 m)
M	Tamarisk, Salt Cedar *Tamarix parviflora, T. ramosissima, T. chinensis, T. gallica*	B	H	x		Washes, streambanks, ditches (<800 m)
M	Tasmanian Blue Gum *Eucalyptus globulus*		M			Disturbed areas (<300 m)
H	Tocalote *Centaurea melitensis*	C	M			Disturbed fields, open woods (<2,200 m)
H	Tree of Heaven *Ailanthus altissima*	C	M			Disturbed urban areas, waste places, riparian areas, grasslands (<1,250 m)
H	Tree Tobacco *Nicotiana glauca*		M			Open disturbed sites (<1,100 m)
H	Water Primrose *Ludwigia peploides*		H			Sloughs and backwaters along the Sacramento River (30 to 60 m)
M	White Horsenettle/ Silverleaf Nightshade *Solanum elaeagnifolilum*	B	D	x		fields, dry disturbed places (<1,200 m)
M	Wild Fennel *Foeniculum vulgare*		H			Roadsides, waste places (<350 m)

Table 13-8
Noxious Weed Species Known or Likely to Occur in the Primary Study Area

Likely to Occur in Primary Study Area[a]	Common Name *Scientific Name*	CDF A List[b]	Cal-I PC List[c]	Local WMA List[d]	Mendocino NF[e] List	Habitat (Elevation)
H	Wooly Mullein *Verbascum thapsus*		L			Disturbed areas (<2,200 m)
H	Yellow Star-Thistle *Centaurea solstitialis*	C	H	x	x	Pastures, roadsides, disturbed grassland or woodland (<1,300 m)

[a]Likelihood of occurring in the Primary Study Area vicinity west of the Sacramento River
H = High; on species checklist from 1998 to 2003 plant surveys
M = Medium; not on Project survey checklist but documented from Colusa and/or Glenn County in CalFlora, CalIPC, CDFA or Oswald
[b]California Department of Food & Agriculture List of Noxious Weeds (List from Important Notice update of January, 2010):
List A - Most invasive wildland pest plants - eradication, containment, or other holding action at the State-county level
List B - Includes species less widespread and more difficult to contain - eradication, containment, control, or other holding action at the discretion of the Commissioner
List C - Weeds that are so widespread that the agency does not endorse State- or county-funded eradication except in nurseries
[c]California Invasive Plant Council (Cal-IPC, 2010) California Invasive Plant Inventory:
H = High: invasive species with most severe wildland ecological impacts, widespread
M = Moderate: invasive species with substantial wildland impacts; local to widespread
L = Low: invasive species with minor wildland ecological impacts; limited distribution, although may be locally problematic
D = Evaluated, but not listed, due to low ecological impacts
[d]On "Dirty Dozen" Noxious Weeds List for Colusa, Glenn, and Tehama County Weed Management Area (CGTWMA, 2002).
[e]On list of weed species of greatest concern and target weed species for Mendocino National Forest (Ruhl, 2006).

Nearly all plant communities within the Primary Study Area have invasive and/or noxious weeds as a component. Some habitats have more serious invasive weed infestations than others. For example, valley annual grassland has 25 to 30 percent exotic species (DWR, 2005), which may include multiple invasive species, such as ripgut (*Bromus diandrus*) or other bromes (*Bromus* spp), hedgehog dogtail (*Cynosurus echinatus*), or medusahead (*Taeniatherum caput-medusae*), resulting in adverse ecological impacts to the native grassland. Certain weed species of greatest concern tend to invade riparian habitats almost exclusively; examples are salt-cedar (or tamarisk - *Tamarix* spp.), giant reed grass (*Arundo donax*) and scarlet wisteria (*Sesbania punicea*). Others invade sensitive wetlands, marsh edges, or vernally wet areas; for example, purple loosestrife (*Lythrum salicaria*), Himalayan blackberry (*Rubus discolor*), pennyroyal (*Mentha pulegium*), tree of heaven (*Ailanthus altissima)*, or edible fig (*Ficus carica*).

Invasive plants potentially occurring in the Primary Study Area that tend to infest still waters (at riparian edges or ponds) include water hyacinth (*Eichhornia crassipes*) (a Cal-IPC "Alert" species[2]), water iris (*Iris pseudacorus*), water primrose (*Ludwigia peploides*), and hydrilla (*Hydrilla verticillata*) (a Cal-IPC "Alert" species and the only species potentially found in the Primary Study Area that is on the federal weed list). Although water primrose is the only one of these aquatic species known to occur in the Primary Study Area, the others are in the Sacramento River watershed and could infest the area at any time. Upland habitats, such as disturbed areas by roads in grassy foothill blue oak woodlands, can become infested with milk thistle (*Silybum marianum*), European olive (*Olea europaea*), California bur-clover

[2] A Cal-IPC Alert species is a species that has an urgent need for eradication.

(*Medicago polymorpha*), Klamathweed (*Hypericum perforatum*), cutleaf geranium (*Geranium dissectum*), or some of the thistles (*Cirsium* and *Centaurea* spp.), or mustards (*Brassica* spp.). Edges of agricultural fields, ranches or homesteads, and roadsides through agricultural areas are also vulnerable to infestations of many invasive weed species.

Banks and terraces along the Sacramento River near the Primary Study Area have infestations of varying sizes of giant reed grass (*Arundo donax*). Other invasive weed species found within the riparian corridor along the river include edible fig (*Ficus carica*), Himalayan blackberry (*Rubus discolor*), and occasional tree tobacco (*Nicotiana glauca*). Scarlet wisteria (*Sesbania punicea*) (a Cal-IPC "Alert" species), has been spotted along the Sacramento River and Feather River and could be spreading downstream in these watersheds into the Primary Study Area. Adjacent sloughs and backwaters along the Sacramento River often are infested by the non-native subspecies of water primrose (*Ludwigia peploides*) and other weedy species. Areas of human habitation along the river often are infested by tree of heaven (*Ailanthus altissima*).

Yellow star-thistle (*Centaurea solstitialis*) is widespread in the proposed Sites Reservoir footprint, as well as in other locations of the Primary Study Area. Many other exotic species of varying degrees of invasiveness (many rated "Moderate" on the current Cal-ICP list) occur in the extensive annual grasslands of the proposed Sites Reservoir footprint and recreation areas. Most of the grassland contains brome (*Bromus*) species and medusahead (*Taeniatherum caput-medusae*) (rated "High" in ecological impacts by Cal-IPC). Italian thistle (*Carduus pycnocephalus*) infestations appear to be spreading rapidly in the foothill canyons at the proposed Sites Reservoir's western edges. Bull thistle (*Cirsium vulgare*) and minor amounts of other thistles occur in scattered small infestations throughout the grassland-oak woodland edges of the proposed Sites Reservoir.

13.2.3.6 Special-Status Plant Species

Federal- or State-Listed Species

During field surveys, no known federal- or State-listed species were found within the Primary Study Area. However, plants observed in the western edges of the Primary Study Area in oak savanna/mixed chaparral have the potential to be identified as Keck's checkerbloom *(Sidalcea keckii)*, a federally endangered species. During field surveys, voucher collections were made for plants thought at the time to be the common northern California species fringed checkerbloom *(Sidalcea diploscypha)*. The two species are similar in appearance and habitat; until 2009, Keck's checkerbloom was understood to occur only in southern California. However, at least one of the Project survey voucher specimens has been annotated to "*cf S. keckii*" (U.C., 2004). This means that plants from this part of western Colusa County could be the federally endangered member of this look-alike pair. When ongoing molecular studies are completed, the potential for occurrence of Keck's checkerbloom in the Primary Study Area will be better understood. As of March 2011, there is some potential that Keck's checkerbloom does occur in the western edges of the Primary Study Area.

Species of Concern

Tables 13-9 and 13-10 provide lists of federal- and State-listed plant species and Species of Concern potentially present in the Primary Study Area. The former federal category "Species of Concern" has been dropped to be consistent with current practices of the CNDDB (DFG, 2010a). In this chapter, "Species of Concern" refers to plant species on CNPS lists 1, 2, and 3; List 4 species are not mapped or tracked by quadrangle map in the CNDDB, so are not included in Table 13-11. As shown in Table 13-9, nine federal- and/or State-listed species potentially occur in the Primary Study Area. For all species listed in Table 13-9, habitat, range, threats, and likelihood of occurrence in the Primary Study Area are discussed in more detailed Life History accounts. For the 30 Species of Concern with potential to occur in the Primary Study Area, habitat information is summarized in Table 13-10.

Table 13-9
Federal- and State-Listed Plant Species with Potential to Occur in the Primary Study Area

Species	Federal Status[a]	State Status[b]
Federal- and State-Listed Plant Species		
Indian Valley Brodiaea (*Brodiaea coronaria* ssp. *rosea)*	None	SE
Hoover's Spurge *(Chamaesyce hooveri)*	T	None
Palmate-Bracted Birds Beak (*Cordylanthus palmatus)*	E	SE
Milo Baker's Lupine (*Lupinus milo-bakeri)*	None	ST
Colusa Grass *(Neostapfia colusana)*	T	SE
Hairy Orcutt Grass *(Orcuttia pilosa)*	E	SE
Keck's Checkerbloom *(Sidalcea keckii)*	E	None
Red Mountain Catchfly *(Silene campanulata* ssp*. campanulata)*	None	SE
Greene's Tuctoria *(Tuctoria greenei)*	E	SR

[a]Federal Status: T=Threatened, E=Endangered, SC=Species of Concern
[b]State Status: SR=State-Listed Rare, ST=State-Listed Threatened, SE=State-Listed Endangered
Source: DFG, 2010a.

Table 13-10
CNPS List 1, 2, and 3 Plant Species with Potential to Occur in the Primary Study Area

Common name Species[a]	New as of Fall 2009[b]	CNPS status[c]	Habitat Type and Typical Elevation Range
Bent-Flowered Fiddleneck *Amsinckia lunaris*[d]		1B.2	Sunny steeply-sloping openings in woodland, grassland/clay-loam with some weathered mudstone; three to 500 meter elevation
Jepson's Milk-Vetch *Astragalus rattanii* var. *jepsonianus*		1B.2	Woodland, grassland/often serpentinite or shaley mudstone dry creek banks; 320 to 600 meter elevation
Ferris' Milk-Vetch *Astragalus tener* var. *ferrisiae*[d]		1B.1	Meadows, grassland, sub-alkaline flats; five to 75 meter elevation
Heartscale *Atriplex cordulata*[d]		1B.2	Chenopod scrub, meadows, grassland, saline/alkaline; one to 375 meter elevation
Brittlescale *Atriplex depressa*[d]		1B.2	Chenopod scrub, meadows, playas, grassland, vernal pools/alkaline, clay; one to 320 meter elevation
San Joaquin Spearscale *Atriplex joaquiniana*[d]		1B.2	Chenopod scrub, meadows, playas, grassland, vernal pools/alkaline; one to 320 meter elevation
Vernal Pool Smallscale *Atriplex persistens*[d]		1B.2	Vernal pools/alkaline; 10 to 115 meter elevation
Big-Scale Balsamroot *Balsamorhiza macrolepis* var. *macrolepis*		1B.2	Chaparral, woodland, grassland/sometimes serpentinite; 90 to 1,400 meter elevation
Round-Leaved Filaree *California macrophylla*[d] [=*Erodium macrophyllum* in Jepson Manual]		1B.1	Woodland, grassland/ clay; 15 to 1,200 meter elevation

Table 13-10
CNPS List 1, 2, and 3 Plant Species with Potential to Occur in the Primary Study Area

Common name Species[a]	New as of Fall 2009[b]	CNPS status[c]	Habitat Type and Typical Elevation Range
Coast Range Bindweed *Calystegia collina* ssp. *tridactylosa*	X	1B.2	Chaparral/woodland/serpentinite, gravelly or rocky openings; zero to 600 meter elevation
Pink Creamsacs *Castilleja rubicundula* ssp. *rubicundula*		1B.2	Grassy openings in chaparral, woodland, meadows, grassland/serpentinite; 20 to 900 meter elevation
Pappose Tarplant *Centromadia parryi* ssp. *parryi*[d] [=*Hemizonia parryi* ssp. parryi in Jepson Manual]		1B.2	Vernally moist alkaline areas in valley and foothill grassland, chaparral, meadows, seeps; two to 420 meter elevation
Stony Creek Spurge *Chamaesyce ocellata* ssp. *rattanii*		1B.2	Chaparral, grassland/sandy, rocky or steep shale slopes, gravelly creek edges; 85 to 800 meter elevation
Dwarf Soaproot *Chlorogalum pomeridianum* var. *minus*		1B.2	Chaparral/serpentinite; 305 to 1,000 meter elevation
Deep-Scarred Cryptantha *Cryptantha excavata*[b]	X	1B.3	Cismontane woodland, sandy or gravelly soil; 100 to 500 meter elevation
Recurved Larkspur *Delphinium recurvatum*		1B.2	Chenopod scrub, woodland, grassland/alkaline; three to 750 meter elevation
Norris' Beard-Moss *Didymodon norrissii*[b]	X	2.2	Cismontane woodland; 600 to 1,973 meter elevation
Brandegee's Eriastrum *Eriastrum brandegeeae*		1B.2	Chaparral, woodland/volcanic or clay-shale soil transition zone; 305 to 1,030 meter elevation
Tracy's Eriastrum *Eriastrum tracyi*		1B.2	Chaparral, woodland; 315 to 975 meter elevation
Snow Mtn. Buckwheat *Eriogonum nervulosum*		1B.2	Chaparral/ serpentinite; 300 to 2,105 meter elevation
Diamond-Petaled California Poppy *Eschscholzia rhombipetala*		1B.1	Grassland/alkaline, clay; zero to 975 meter elevation
Adobe Lily *Fritillaria pluriflora*[d]		1B.2	Chaparral, woodland, grassland/adobe clay, often cool exposures; 60 to 705 meter elevation
Hall's Harmonia *Harmonia hallii*		1B.2	Chaparral/serpentinite; 500 to 900 meter elevation
Drymaria-Like Western Flax *Hesperolinon drymarioides*		1B.2	Chaparral, woodland, grassland/serpentinite; 100 to 1,130 meter elevation
Woolly Rose-Mallow *Hibiscus lasiocarpos* ssp. *occidentalis*		1B.2	Freshwater marsh, slough edges; zero to 120 meter elevation
Bolander's Horkelia *Horkelia bolanderi*	X	1B.2	Chaparral, valley and foothill grassland, meadows and seeps; 450 to 1,100 meter elevation
Coulter's Goldfields *Lasthenia glabrata* ssp. *coulteri*[d]		1B.1	Coastal salt marsh, saline vernal pools, playas, alkali flats; one to 1,220 meter elevation
Colusa Layia *Layia septentrionalis*		1B.2	Chaparral, woodland, grassland/sandy, serpentinite; 100 to 1,095 meter elevation

Table 13-10
CNPS List 1, 2, and 3 Plant Species with Potential to Occur in the Primary Study Area

Common name Species[a]	New as of Fall 2009[b]	CNPS status[c]	Habitat Type and Typical Elevation Range
Heckard's Pepper-Grass *Lepidium latipes* var. *heckardii*[d]		1B.2	Grassland/alkaline flats; 10 to 200 meter elevation
Red-Flowered Lotus *Lotus rubriflorus*[d]		1B.1	Openings in woodland, grassland/heavy clay; 200 to 425 meter elevation

[a]Nomenclature corresponds to CNPS, 2010.

[b]New as of Fall 2009: these species were not included on previous lists of special-status species potentially present in the Primary Study Area, including lists used for conducting rare plant surveys due to new occurrences being recently added to the CNDDB spatial layer or appearing in updated (November 2009) Rarefind queries of Primary Study Area quadrangle maps. Exception: *Cryptantha excavata* was on CNPS List 4 during Project surveys.

[c]California Native Plant Society (CNPS, 2009): List 1A= plants presumed extinct in California; List 1B = plants rare, threatened, or endangered in California and elsewhere; List 2 = plants rare, threatened, or endangered in California but common elsewhere; List 3 = plants about which more information is needed to determine current status. CNPS threat codes: 0.1: Seriously endangered in California. 0.2: Fairly endangered in California; 0.3: Not very endangered in California.

[d]Species reported to occur (DFG, 2009b) near the Primary Study Area, or found during Project surveys.

CNPS List 4 species from Colusa and Glenn counties that occur in elevations and habitats of the Primary Study Area are listed in Table 13-11; species added to List 4 since fall 2009 are noted.

Seven CNPS List 1B species were found during field surveys that were conducted within the Primary Study Area (Table 13-12). New occurrences of Adobe lily (*Fritillaria pluriflora*), Bent-flowered fiddleneck (*Amsinckia lunaris*), Round-leaved filaree (*California macrophylla)*, and Red-flowered lotus (*Lotus rubriflorus)* were found in the western edges of the Primary Study Area in blue oak savanna. The Red-flowered lotus was not known from the area prior to Project surveys; the nearest known occurrences was seven miles west of the proposed Sites Reservoir footprint. Brittlescale (*Atriplex depressa)*, San Joaquin spearscale (*A. joaquiniana*), and *Centromadia parryi* (both subspecies) were found at the eastern edge of the Primary Study Area in weakly saline/alkaline flats. Table 13-12 lists the special-status species found during field surveys, with number of occurrences per species.

Table 13-11
Special-Status/CNPS List 4 Limited Distribution Plant Species known from Colusa or Glenn Counties, with Potential to Occur in the Vicinity of the Primary Study Area

Common Name	Scientific Name
Purdy's Onion	*Allium fimbriatum* var. *purdyi*
Fairy Candelabra	*Androsace elongata* ssp. *acuta*
Dimorphic Snapdragon	*Antirrhinum subcordatum*
Serpentine Milkweed	*Asclepias solanoana*
Brewer's Milk-Vetch	*Astragalus breweri*
Cleveland's Milk-Vetch	*Astragalus clevelandii*
Depauperate Milk-Vetch	*Astragalus pauperculus*
Rattan's Milk-Vetch	*Astragalus rattanii* var. *rattanii*
Crownscale	*Atriplex coronata* var. *coronata*[a]
Parry's Red Tarplant	*Centromadia [=Hemizonia] parry* ssp. *rudis*[a]
Tracy's Clarkia	*Clarkia gracilis* ssp. *tracyi*[a]
Serpentine Collomia	*Collomia diversifolia*
Small Spikerush	*Eleocharis parvula*[a]

Table 13-11
Special-Status/CNPS List 4 Limited Distribution Plant Species known from Colusa or Glenn Counties, with Potential to Occur in the Vicinity of the Primary Study Area

Common Name	Scientific Name
Tripod Eriogonum	*Eriogonum tripodum*
Purdy's Fritillary	*Fritillaria purdyi*[a]
Serpentine Sunflower	*Helianthus exilis*
Hogwallow Evax	*Hesperevax caulescens*
Ferris' Goldfields	*Lasthenia ferrisiae*[a]
Woolly Meadowfoam	*Limnanthes floccosa* ssp. *floccosa*
Broad-Lobed Linanthus	*Linanthus* [now=*Leptosiphon*] *latisectus*
Hoover's Lomatium	*Lomatium hooveri*
Heller's Bush Mallow	*Malacothamnus helleri*[b]
Sylvan Microseris	*Microseris sylvatica*
Shield-Bracted Monkeyflower	*Mimulus glaucescens*
Cotula Navarretia	*Navarretia cotulifolia*[a]
Hoary Navarretia	*Navarretia eriocephala*
Tehama Navarretia	*Navarretia heterandra*
Jepson's Navarretia	*Navarretia jepsonii*
Adobe Navarretia	*Navarretia nigelliformis* ssp. *nigelliformis*[a]
Awl-leaved Navarretia	*Navarretia subuligera*
Howell's Broom-Rape	*Orobanche valida* ssp. *howellii*
Sickle-Fruited Jewel-Flower	*Streptanthus drepanoides*

[a]Added after Fall 2009.
[b]Taxon recognized in CNPS, 2001; treated as a "form" of *M. fremontii* in the Jepson Manual (Hickman, 1993).
Note:
Nomenclature corresponds to CNPS, 2010, unless otherwise noted.

Table 13-12
Special-Status Plant Species and Occurrences Found during Field Surveys by Species for Surveyed Primary Study Area

Status	Special-Status Plant Species	Number of Occurrences Found Within Project Features (Species/ Occurrences)	Number of Occurrences Found Outside Project Features (Species/ Occurrences)	Grand Total (Species/ Occurrences)
Federal Endangered	Keck's Checkerbloom *Sidalcea keckii*[a](possible)	0	**1**	**1/1**
CNPS List 1B	Bent-Flowered Fiddleneck *Amsinckia lunaris*	3	0	3
	Brittlescale *Atriplex depressa*[b]	0	3	3
	San Joaquin Spearscale *Atriplex joaquiniana*	0	1	1
	Round-Leaved Filaree *California macrophylla*	1	0	1
	Pappose Tarplant *Centromadia parryi* ssp. *parryi*	0	1	1
	Adobe Lily *Fritillaria pluriflora*	5	0	5

Table 13-12
Special-Status Plant Species and Occurrences Found during Field Surveys by Species for Surveyed Primary Study Area

Status	Special-Status Plant Species	Number of Occurrences Found Within Project Features (Species/ Occurrences)	Number of Occurrences Found Outside Project Features (Species/ Occurrences)	Grand Total (Species/ Occurrences)
	Red-Flowered Lotus *Lotus rubriflorus*	6	0	6
	Total List 1B	**4/15**	**3/5**	**7/20**
CNPS List 4	Fairy Candelabra *Androsace elongata* ssp. *acuta*	12	0	12
	Dimorphic Snapdragon *Antirrhinum subcordatum*	2	0	2
	Parry's Rough Tarplant *Centromadia parryi* ssp. *rudis*[b]	0	2	2
	Hogwallow Starfish *Hesperevax caulescens*[b]	16	1	17
	Heller's Bush Mallow *Malacothamnus helleri*	9	0	9
	Sylvan Scorzonella *Microseris sylvatica*	3	0	3
	Hoary Navarretia *Navarretia eriocephala*	1	0	1
	Tehama Navarretia *Navarretia heterandra*[b]	12	2	14
	Adobe Navarretia *Navarretia nigelliformis*[a,b]	4	0	4
	Total List 4	**8/59**	**3/5**	**11/64**
TOTAL # Species/Occurrences		**12/74**	**7/11**	**19/85**

[a]Not on the search list during 1998 to 2003 Project surveys, but included on search lists used in 2010 and 2011.
[b]One or more occurrences found during 2010 and 2011 surveys.
Notes:
All occurrences found in 1998 to 2003 surveys unless otherwise noted with "b".
CNPS, 2009: CNPS 1B (Plants rare, threatened, or endangered in California and elsewhere); CNPS List 4 (Plants of limited distribution).

None of the other special-status species listed in Tables 13-9, 13-10, and 13-11 as having potential to occur in the Primary Study Area were found during Project field surveys. Six CNPS List 1B species known from saline/alkaline vernal wetlands or flats in the Sacramento Valley, mostly in and around the Sacramento, Colusa, and Delevan NWRs near the Primary Study Area (DFG, 2010a), were not found during Project field surveys.

Eight CNPS List 4 species were found during Project surveys while searching for the state- and federally listed and List 1B species (Table 13-12). Prior to Project surveys, Fairy candelabra (*Androsace elongata* ssp. *acuta)* had not been reported in Glenn or Colusa County. As a result of Project survey findings, distributions were similarly updated or expanded for other species such as Heller's bush mallow (*Malacothamnus helleri)*, Sylvan scorzonella (*Microseris sylvatica)*, Tehama navarretia (*Navarretia heterandra)*, and Adobe navarretia (*Navarretia nigelliformis)*.

Project field surveys were all floristic (all plants observed were identified to species and recorded). A complete list of plant species found by Project feature location is included in the Botanical Progress Reports prepared during the course of these studies (DWR, 2005).

13.3 Environmental Impacts/Environmental Consequences

13.3.1 Regulatory Setting

Botanical resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

13.3.1.1 Federal Plans, Policies, and Regulations

- National Environmental Policy Act
- Federal Endangered Species Act
- Executive Order 11312: Invasive Species

13.3.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act
- California Endangered Species Act
- California Native Plant Society List
- Natural Communities Conservation Planning Act
- California Fish and Game Code Section 1900-1013: Native Plant Protection Act
- Sections of the California Fish and Game Code Pertaining to Invasive and Noxious Plant Species

13.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan
- Colusa County Voluntary Oak Woodlands Management Plan

13.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for botanical resources:

Would the Project:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game (DFG) or U.S. Fish and Wildlife Service (USFWS)?

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by DFG or USFWS?

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A substantial adverse effect, including conversion to non-native vegetation, on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by DFG or USFWS, or any native plant community known to be rare, unusual, or becoming uncommon in the biogeographic region of the Project (for the Primary Study Area, the Inner North Coast Range/Sacramento Valley edge).
- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS.
- An increase in potential for the invasion or spread of noxious weed species.
- Indirect impacts to native plants from human disturbance.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local or regional habitat conservation plan, or conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

13.3.3 Impact Assessment Assumptions and Methodology

13.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to botanical resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect

effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- Borrow areas for dam construction materials would be located within the proposed Sites Reservoir footprint, or materials would be obtained from commercial sources outside of the Primary Study Area.
- Frequent Sites Reservoir water level fluctuations would create a barren drawdown zone.
- For all Project facilities that do not have a defined construction disturbance area, an additional 10 percent of the facility footprint acreage is assumed to be the size of the associated disturbance area.
- Periodic maintenance of the proposed pipelines and transmission lines would be conducted on foot and/or by using established roads for vehicle access, and would not require vehicle access over established or restored vegetation.

13.3.3.2 Methodology

Impacts to native vegetation communities were assessed in relation to lost[3], altered[4], or disturbed[5] vegetation. Impacts to special-status plant species were evaluated relative to both habitat loss and loss or disturbance to known occurrences. Impacts relative to noxious weeds were also addressed in terms of potential for increase and spread. Analysis of the impacts of human disturbance to native plants included consideration of the impacts of human disturbance to special-status plant species. Direct impacts to vegetation communities include permanent loss, disruption of hydrological regime, and mechanical disturbance. Indirect impacts include ground-disturbing activities that result indirectly from the Project (i.e., erosion, dust, or trampling from increased foot traffic or human pet use), as well as changes to habitat suitability due to accidental introduction of invasive weeds. Impacts can be positive or negative, and can be short-term (temporary) or long-term (permanent). In some cases, apparently short-term/temporary impacts can be equivalent to long-term impacts, where a disturbed area does not return to its original state after construction activities cease.

Approximately 15 percent of the total footprint of each Recreation Area would be subject to permanent disturbance. Because the exact location and area affected by the construction of the recreation areas is not known, the extent of permanent vegetation loss was estimated by applying a 15 percent multiplier to each vegetation type present.

Of the 200-foot-wide total construction disturbance area associated with road construction, an approximate average of 60 feet (30 percent) would result in the permanent loss of native vegetation. A 30 percent multiplier was, therefore, applied to each vegetation type present.

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[3] Lost vegetation communities cannot be restored.

[4] Altered vegetation communities are communities that have been manipulated.

[5] Disturbed vegetation communities are communities that have been damaged or compromised (such as by trampling or driving through) but are still the same vegetation type.

For the Delevan Transmission Line, a worst-case scenario of 70 transmission line towers with a concrete pad for a base along the entire length of the transmission line was used to calculate the area of permanent disturbance for Alternatives A and C. A worst-case scenario of 15 transmission towers with a concrete pad for a base for the length of the transmission line was used to calculate the area of permanent disturbance for Alternative B.

Calculated acres of natural habitats and agricultural lands represent the 2009 baseline conditions (i.e., Existing Conditions).

The botanical resources impact assessment relied on hydrologic and operational modeling performed using CALSIM II to provide a quantitative basis from which to assess the potential impacts of the alternatives on vegetation communities in portions of the Extended and Secondary study areas. Monthly river flows, and water surface elevations derived based on monthly river flows and end-of-month reservoir storages from CALSIM II, provided a quantitative basis to assess the potential impacts of operations on vegetation communities, relative to the CEQA and NEPA bases of comparison, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). Detailed discussion of the CALSIM II model is provided in Appendix 6B.

Further, in assessing the impacts to the valley foothill riparian vegetation along the Sacramento River in the Secondary Study Area, modeling specific to riparian vegetation, including results from the SRH-1DV and SacEFT models, was used.

The SRH-1DV model simulates the establishment, growth, and mortality of vegetation, in addition to computing hydraulics and groundwater surface in the riparian zone near the river. The simulation tracks daily vegetation changes through 82 years of simulated flow within the 107 river miles of Sacramento River from upstream of Red Bluff to Colusa. The SRH-1DV analysis focuses on four key valley foothill riparian vegetation types: cottonwood, mixed forest, Gooding's black willow, and narrow leaf willow. The detailed description of the SRH-1DV model and the associated alternatives evaluation is provided in Appendix 8A.

The SacEFT is a decision support tool that links flow management actions on the Sacramento River to changes in the physical habitats for several focal species of concern. It specifically includes performance measures for evaluating the effects of various flow scenarios on the initiation success and post-initiation scour risk of the Fremont Cottonwood seedlings. These performance measures are used as a general indicator for assessing the impacts on riparian vegetation along the Sacramento River in the Secondary Study Area. The detailed description of the SacEFT model and the associated alternatives evaluation is provided in Appendix 8B.

13.3.4 Topics Eliminated from Further Analytical Consideration

Because no Project facilities would be constructed or maintained within the Extended Study Area, only operational impacts associated with Alternatives A, B, and C are discussed in the impacts analysis for the Extended Study Area for the three alternatives.

As indicated in the Environmental Setting/Affected Environment discussion, no native vegetation types are described for the urban or agricultural lands included in the water delivery service areas of the Extended Study Area. They are, therefore, not evaluated.

Project-related activities that would occur within the Secondary Study Area at the Red Bluff Pumping Plant on the Sacramento River were not evaluated because those activities would occur within the footprint of the existing pumping plant facility, and therefore, are not anticipated to affect botanical resources. Because no construction or maintenance activities would occur within the remainder of the Secondary Study Area, only operational impacts associated with Alternatives A, B, and C are discussed in the impacts analysis for the reservoirs and waterways included in the Secondary Study Area for the three alternatives.

The Tunnel from Sites Pumping/Generating Plant to Sites Reservoir and Existing Funks Reservoir Dredging (both facilities would be located within the Primary Study Area) were not evaluated because construction, operation, and maintenance of these facilities would occur within the footprint of the existing facility, or would have no associated above-ground disturbance, and therefore, are not anticipated to affect botanical resources.

Because the Primary Study Area Project facilities with an above-ground footprint would result in permanent vegetation loss during their construction, the impact of the operation and maintenance of those facilities on vegetation communities (**Impact Bot-1**) is not discussed. Similarly, when the permanent loss of a vegetation community resulting from Project facility construction would make that location unsuitable for, or unable to support, specific special-status plant species, the impact of the operation and maintenance of that facility on the species (**Impact Bot-2**) is not discussed.

13.3.5 Impacts Associated with the No Project/No Action Alternative

13.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to native plant communities has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on native plant communities, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Urbanization that is planned according to General Plans could be expected to cause the conversion of native vegetation, riparian habitat, and sensitive natural communities to urban uses. However, General Plans and any related construction activities would be subject to their own environmental reviews. Therefore, population growth associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on native vegetation, riparian habitat, and sensitive natural communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Bot-1** discussion. That discussion is also applicable to special-status plant species.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Refer to the **Impact Bot-1** discussion. That discussion is also applicable to noxious weed species.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-1** discussion. That discussion is also applicable to potential effects to native plants from human disturbance.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-1** discussion. That discussion is also applicable to conflicts with conservation plans.

San Luis Reservoir

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in the same or slightly decreased water level elevations during most water years, and the same or slightly increased water level elevations during Dry and Critical years at San Luis Reservoir. These negligible fluctuations in surface water elevations would not be expected to affect the small pockets of native riparian vegetation that exist around the reservoir, nor would it be expected to have substantial adverse effects on riparian-associated native plant species. Due to already large water level fluctuations, the drawdown zone of San Luis Reservoir supports virtually no native vegetation communities (only scattered vegetation composed of mostly non-native species). The slight changes in surface water elevations at San Luis Reservoir that would result from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on native plants and native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No native vegetation communities or associated special-status plant species are supported in the drawdown zone of San Luis Reservoir, and no special-status plant species are recorded for this location (DFG, 2010a). Therefore, the slight changes in surface water elevations at San Luis Reservoir resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Existing large water level fluctuations in the drawdown zone of San Luis Reservoir already spread non-native vegetation around in its available exposed substrate. The slight changes in surface water elevations at San Luis Reservoir resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on the invasion or spread of noxious weed species, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

None of the projects included in the No Project/No Action Alternative are located at San Luis Reservoir. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated water level fluctuations at San Luis Reservoir would be within the historical range of operation, and consequently, would not conflict with any HCPs, NCCPs, or local plans. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

13.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in no change to surface water elevations at Trinity or Shasta lakes, and therefore, **would not result in a substantial adverse effect** to native plant communities. Modeling shows expected slight decreases in surface water elevations at Lake Oroville and Folsom Lake, but the amounts are minor and would not be expected to affect native plant communities. Therefore, surface water elevation fluctuations at these two reservoirs associated with implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** to native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No change in surface water elevations are expected at Trinity or Shasta lakes; therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on special-status plant species, when compared to Existing Conditions. At Lake Oroville and Folsom Lake, the expected slight decreases in water levels resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Existing water level fluctuations in the drawdown zone of all the listed lakes already spread non-native vegetation around in the available exposed substrate. No changes in surface water elevations are expected at Trinity or Shasta lakes; therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on invasion or spread of noxious weed species at these reservoirs, when compared to Existing Conditions. At Lake Oroville and Folsom Lake, the slight decreases in surface water elevations expected from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on the invasion or spread of noxious weed species, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to native plant species and communities has been addressed in those environmental documents. Therefore, implementation of these projects **would not have a substantial adverse effect** on native plant species and communities in the Secondary Study Area, when compared to Existing Conditions.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion. That discussion is also applicable to conflicts with conservation plans.

Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling was not conducted for Lewiston Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex. However, modeling conducted on the reservoirs upstream of these reservoirs indicates that the No Project/No Action Alternative, when compared to Existing Conditions, would result in either no change or slight changes to surface water level elevations. Because these reservoirs would continue to operate as regulating reservoirs, it is assumed that there would be little or no change in surface water level elevations, and they, therefore, **would not have a substantial adverse effect** on bordering native plant communities, when compared to Existing Conditions. Modeling was conducted for Whiskeytown Lake for flows downstream of the lake, and flows would experience slight but insignificant changes. Because the reservoir upstream of Whiskeytown would not experience substantial changes, and the flows released from Whiskeytown would experience only slight changes, surface water elevations would not be expected to fluctuate, and therefore, **would not have a substantial adverse effect** on bordering native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because little or no change is expected in surface water elevations at Lewiston Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex, the No Project/No Action Alternative **would not result in a substantial adverse effect** on special-status plant species, when compared to Existing Conditions. At Whiskeytown Lake, the expected slight changes in water levels resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because little or no change is expected in surface water elevations at Lewiston Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on invasion or spread of noxious weed species, when compared to Existing Conditions. At Whiskeytown Lake, the expected slight changes in water levels resulting from implementation of the No Project/No Action Alternative would not have a **substantial adverse effect** on the invasion or spread of noxious weed species, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Trinity River

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results for Trinity River flows downstream of Lewiston Lake for the No Project/No Action Alternative, when compared to Existing Conditions, indicate slight changes in flows during Below Normal, Dry, or Critical water years. However, large decreases in flow are indicated during March and April of Wet water years, and large increases in February flows in Above Normal water years. These changes in the flow regime have the potential to adversely affect riparian plant communities bordering the river. However, native riparian vegetation is adapted to flow variations, and the expected timing of flow changes would result in the least effect on streamside vegetation. Decreases in spring flows during Wet water years, when flows are high, and increases in flow during late winter in Above Normal water years, would not be expected to substantially adversely affect riparian vegetation. These modifications of the flow regime of the Trinity River from implementation of the No Project/No Action Alternative, therefore,

would not have a substantial adverse effect on native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Little change in stream-edge native plant communities would occur due to expected flow modifications. Implementation of the No Project/No Action Alternative, therefore, **would not result in a substantial adverse effect** on special-status plant species on the Trinity River downstream of Lewiston Lake, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Little change in stream-edge native plant communities would occur due to expected flow modifications. Implementation of the No Project/No Action Alternative, therefore, **would not result in a substantial adverse effect** on the invasion or spread of noxious weed species on the Trinity River downstream of Lewiston Lake, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Klamath River downstream of the Trinity River

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results for the Klamath River downstream of the Trinity River for the No Project/No Action Alternative, when compared to Existing Conditions, indicate negligible changes in flows. These negligible changes in the flow regime would not be expected to adversely affect riparian plant communities. Implementation of the No Project/No Action Alternative, therefore, **would not result in a substantial adverse effect** on native plant communities on the Klamath River downstream of the Trinity River, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Klamath River flow regime downstream of the Trinity River would be negligible and would not adversely affect riparian plant communities, they would also not be expected to have an adverse effect on riparian-associated special-status plant species. Implementation of the No Project/No

Action Alternative, therefore, **would not result in a substantial adverse effect** on special-status plant species on the Klamath River downstream of the Trinity River, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Negligible flow regime changes would not be expected to result in changes in stream-edge native plant communities. Therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on the invasion or spread of noxious weed species on the Klamath River downstream of the Trinity River, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Spring Creek

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Operational modeling was not performed for Spring Creek. However, if the No Project/No Action Alternative is implemented, operations of Whiskeytown Lake and Keswick Reservoir are expected to result in slight changes, and therefore, would not be expected to alter the released flows that dilute Spring Creek runoff. Because no change in the dilution of Spring Creek runoff is expected, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on any existing native streamside plant communities at Spring Creek, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because no change in stream-edge native plant communities due to flow modifications is expected, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on special-status plant species on Spring Creek, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because no change in stream-edge native plant communities due to flow modifications is expected, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on the invasion or spread of noxious weed species on Spring Creek, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Sacramento River

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall negligible change to the flow regime of the Sacramento River, with the exception of decreased flows downstream of Keswick Reservoir in November during Dry years. Large changes in the flow regime have the potential to adversely affect riparian plant communities. However, existing riparian vegetation is adapted to flow variations, and changes in flow during one month in Dry years would not be expected to substantially adversely affect riparian vegetation. Therefore, the modifications to the flow regime of the Sacramento River **would not have a substantial adverse effect** on bordering native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because little change in stream-edge native plant communities due to flow modifications is expected, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on special-status plant species on the Sacramento River downstream of Keswick Reservoir, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because little change in stream-edge native plant communities due to flow modifications is expected, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on the invasion or spread of noxious weed species on the Sacramento River downstream of Keswick Reservoir, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Clear Creek

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall small change to the flow regime of Clear Creek, with the exception of large increases in flows during Critical years. These changes in the flow regime have the potential to adversely affect riparian plant communities. However, an increase in flow during Critically Dry years could reduce or prevent the desiccation of riparian vegetation; therefore, implementation of the No Project/No Action Alternative **would have a potentially beneficial effect** on native plant communities bordering Clear Creek, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Clear Creek flow regime during Critical years would have a potentially beneficial impact on native riparian vegetation, the flow regime changes would not be expected to have an adverse effect on riparian-associated native plant species. Changes in the Clear Creek flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status native plant species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because little change in stream-edge native plant communities due to flow modifications is expected, except for potential benefits from large flow increases during Critically Dry years, implementation of the No Project/No Action Alternative **would result in a potentially beneficial effect** on the invasion or spread of noxious weed species on Clear Creek (i.e., a reduction in the invasion or spread of the noxious weeds), when compared to Existing Conditions. The spread of invasive weed species can occur after mortality or disturbance to native vegetation, so preventing desiccation of native riparian vegetation would keep the native streamside plant communities more resistant to weed infestation.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Feather River

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in numerous large changes to the flow regime of the Feather River. These changes in the flow regime have the potential to adversely affect riparian native plant communities. The changes to the flow regime that are most likely to affect riparian vegetation include greatly increased flows ranging from June through September during certain water year types, which have the potential to inundate riparian vegetation. Adverse effects could also result from expected large decreases in flows during late August in Dry years, which could desiccate riparian vegetation. For the Feather River, this would be particularly adverse to native riparian vegetation because the controlled flow regime from Oroville Dam already subjects the river's low-flow channel edges to scouring flows, which keep streamside vegetation in an early successional stage, favoring invasion of noxious weed species; controlled conditions downstream of the Thermalito Afterbay Outlet are also not favorable to riparian forest recruitment or species diversity (DWR, 2007). The modifications of the Feather River's existing flow regime resulting from implementation of the No Project/No Action Alternative could further adversely affect riparian vegetation, and therefore, **would have a potentially substantial adverse effect** on bordering native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because potentially adverse changes in stream-edge native plant communities are expected due to expected flow modifications, the No Project/No Action Alternative has the potential to result in adverse impacts to any special-status plant species associated with streamside plant communities. However, no special-status plant species are currently known to exist at or adjacent to the stream edges of the Feather River downstream of the Lake Oroville facilities (DFG, 2010a; DWR, 2007). Therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on special-status plant species on the Feather River downstream of Lake Oroville, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because potentially adverse changes in stream-edge native plant communities are expected due to expected flow modifications, implementation of the No Project/No Action Alternative has the potential to result in adverse impacts associated with the invasion or spread of noxious weed species on the Feather River downstream of Lake Oroville. Because the spread of invasive weed species can occur after mortality or disturbance to native vegetation, scouring or desiccation of riparian vegetation due to the further exaggerated seasonal flow regime alterations on the Feather River would make the already struggling native streamside plant communities less resistant to weed infestation. Modifications of the existing flow regime resulting from implementation of the No Project/No Action Alternative **would, therefore, have a potentially substantial adverse effect o**n the invasion or spread of noxious weed species on the Feather River, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Sutter Bypass

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in a small change in spills into Moulton, Tisdale, and Ord Ferry weirs. Colusa Weir would experience a decrease in spills during November, especially in Dry years. Changes to the flow regime of the Sutter Bypass have the potential to adversely affect riparian native plant communities that have accumulated along some of the edges of the Bypass. However, three of the four weirs that spill into the Bypass are not expected to experience large changes in flows, and Colusa Weir would only experience large decreases in flood flows during November. The riparian vegetation within the Sutter Bypass has adapted to flow variations, and changes in flow from one weir during one month would not be expected to substantially adversely affect the riparian vegetation. Therefore, the No Project/No Action Alternative's modifications of the existing flow regime **would not have a substantial adverse effect** on riparian native plant communities in the Sutter Bypass, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Becausee only minor potential changes are expected in the Sutter Bypass stream-edge native plant communities due to expected flow modifications, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species associated with streamside plant communities along Bypass edges. One special-status plant species, the woolly rose-mallow or California hibiscus (*Hibiscus lasiocarpos* var. *occidentalis*) is currently known to exist at or adjacent to the edges of the Sutter Bypass (DFG, 2010a). Therefore, implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on this special-status species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because only minor potential changes are expected in the Sutter Bypass stream-edge native plant communities due to expected flow modifications, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on the invasion or spread of noxious weed species along Bypass edges, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative. That discussion is also applicable to conflicts with conservation plans.

Yolo Bypass

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in a small change in monthly flows into the Yolo Bypass, with the exception of large decreases in flow during late fall in Below Normal and Dry years. Changes to the flow regime of the Yolo Bypass have the potential to adversely affect riparian native plant communities that have accumulated along some of the edges of the Bypass. However, riparian vegetation is adapted to flow variations, and decreases in flood flows during late fall in Below Normal and Dry years would not be expected to substantially adversely affect riparian vegetation. Therefore, modifications to the flow regime of the Yolo Bypass resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on native plant communities, when compared to Existing Conditions. This would include riparian edges as well as communities established in the interior of the Bypass, such as grasslands and seasonal wetlands.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because only minor potential changes are expected in the Yolo Bypass stream-edge or interior native plant communities due to expected flow modifications, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species associated with streamside plant communities along Bypass edges, when compared to Existing Conditions. Minor effects are expected to occur in interior Bypass herbaceous communities from the expected decreases in late fall flows in Dry years. Four special-status plant species (*Astragalus tener* var. *ferrisiae* [Ferris' milkvetch], *Astragalus tener* var. *tener* [alkali milkvetch], *Lepidium latipes* var. *heckardii* [Heckard's peppergrass], and *Navarretia leucocephala* ssp. *bakeri* [Baker's navarretia]) are currently known to exist in the interior of the Yolo Bypass (DWR, 2010a) in DFG Wildlife Area units. The Dry year late fall flow decreases resulting from implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on these special-status species (all are on CNPS List 1B), when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because only minor potential changes are expected in the Yolo Bypass stream-edge or interior native plant communities due to expected Dry year late fall flow decreases, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on the invasion or spread of noxious weed species, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative. That discussion is also applicable to conflicts with conservation plans.

American River

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in a decrease in flows in the American River in all months except for December. Large decreases in flows are also indicated in September of Above Normal years, September and October of Below Normal years, and in August and September in Critically Dry years. This reduction in flows, coupled with the substantial reductions in flows during early fall in some water year types, has the potential to affect riparian native plant communities adversely by desiccating established vegetation and reducing recruitment. Modifications to the existing flow regime of the American River resulting from implementation of the No Project/No Action Alternative **would, therefore, have a potentially substantial adverse effect** on bordering native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because substantial potential changes are expected in the native plant communities along the American River due to expected flow decreases, implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on special-status plant species associated with streamside plant communities along the river edges, when compared to Existing Conditions. One special-status plant species, *Sagittaria sanfordii* (Sanford's arrowhead), is currently known to exist near the edges of the American River (DFG, 2010a); the overall flow decrease and large decreases in late-summer/early fall resulting from implementation of the No Project/No Action Alternative **would result in a potentially significant impact** on this special-status species (a CNPS List 1B species), when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because potential adverse changes are expected in the native plant communities along the American River due to expected flow decreases, implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on the invasion or spread of noxious weed species along the river edges, when compared to Existing Conditions. The flow decrease and large decreases in late summer/early fall could reduce the extent and health of existing native riparian vegetation, making the native plant communities less resistant to the invasion and spread of noxious weeds if the No Project/No Action Alternative is implemented.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Sacramento-San Joaquin Delta

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in a negligible change in Delta monthly outflow. This lack of change to Delta outflow **would not have a substantial adverse effect** on native plant communities of the Delta, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because only minor potential changes are expected in the Delta waters-edge native plant communities due to expected flow modifications, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status plant species associated with native plant communities bordering Delta sloughs and channels, when compared to Existing Conditions. At least 69 special-status plant species are currently known to exist in the Delta (DFG, 2010a; refer to Table 13-5 and Appendix 13B). Implementation of the No Project/No Action Alternative **would not result in a substantial adverse effect** on these special-status species, when compared with Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because only minor potential changes are expected in the Delta waters-edge native plant communities due to expected flow modifications, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on the invasion or spread of noxious weed species along edges of Delta sloughs and channels, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in a negligible change in the position of X2, as well as a negligible change in Delta monthly outflow. Because Suisun, San Pablo, and San Francisco bays would not be expected to experience any large salinity or flow changes, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on bordering native riparian or wetland plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Bot-1** discussion. Because Suisun, San Pablo, and San Francisco bays would not be expected to experience any large salinity or flow changes, implementation of the No Project/No Action

Alternative **would not have a substantial adverse effect** on special-status plant species occurring along Bay edges, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Refer to the **Impact Bot-1** discussion. Because Suisun, San Pablo, and San Francisco bays are not expected to experience any large salinity or flow changes, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on the invasion or spread of noxious weed species along edges of the bays, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with conservation plans.

13.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

If the No Project/No Action Alternative is implemented, the Project would not be built and there would, therefore, be no construction, operation, or maintenance impacts within the Primary Study Area. In addition, none of the projects included in the No Project/No Action Alternative are located within the Primary Study Area.

It is expected that current patterns of land use would continue in the area, and despite expected growth within Glenn and Colusa counties throughout the period of Project analysis (i.e., 100 years), no large-scale development or other substantial changes in land use would occur. Cattle grazing, fuelwood harvest, and agricultural cultivation would most likely continue at or near current levels. In addition, the slow compaction, erosional, and seedling removal effects of grazing would continue in all grassland and most blue oak woodland areas.

Continued fuelwood harvest in blue oak woodlands at the valley's edges would eventually convert whole hillsides from wooded to open grassland, and agricultural lands would continue to occupy the same or slightly increased areas of formerly native vegetation, Therefore, activities within the Primary Study Area that would occur as a result of implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on native plant communities, when compared to Existing Conditions.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Bot-1** discussion. In addition, habitat deterioration at the blue oak-grassland interface would reduce the suitable area available to *Amsinckia lunaris* (bent-flowered fiddleneck), *Lotus rubriflorus*, (red-flowered lotus), *Sidalcea keckii* (Keck's checkerbloom), *California macrophylla* (round-leaved filaree), and other special-status species that depend on this native plant community ecotone. Therefore, activities within the Primary Study Area with implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on special-status plant species, when compared to Existing Conditions.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Refer to the **Impact Bot-1** discussion. In addition, the spread of non-native species, such as Italian plumeless thistle (*Carduus pycnocephalus*), yellow star-thistle (*Centaurea solstitialis*), and others would continue in all disturbed grassland and blue oak woodland areas with grassy understories at edges of disturbance. Similar impacts would continue in and along stream channels in grazed areas, producing a slow deterioration of their riparian character. The feral pig population would most likely continue to increase and contribute to increased invasion of non-native plant species in their areas of ground disturbance (mostly at the blue oak woodland/grassland interface). Continued fuelwood harvest in blue oak woodlands at the valley's edges would eventually convert whole hillsides from wooded to open grassland, further contributing to the increase in non-native species that is typical of the annual grasslands of the Primary Study Area. Agricultural lands would continue to occupy the same or slightly increased areas of formerly native vegetation, and continue to provide seed sources for non-native plant species.

Therefore, activities within the Primary Study Area with implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on the spread of noxious weed species, when compared to Existing Conditions.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

None of the projects included in the No Project/No Action Alternative would occur within the Primary Study Area. Therefore, **there would not be a substantial adverse effect** to native plant species or communities from construction, operation, or maintenance-related activities, when compared to Existing Conditions.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

There are no HCPs or NCCPs located within the Primary Study Area. Additionally, none of the projects included in the No Project/No Action Alternative would occur within the Primary Study Area. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

13.3.6 Impacts Associated with Alternative A

13.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Level 4 water supply benefits numerous native plant species and plant associations that use fresh emergent wetland habitat. Implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would provide an alternate source of Level 4 water in some years, but would not increase its reliability. Therefore, the provision of an alternate source of Level 4 water supply would have **no impact** on native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

An alternate source of Level 4 water would not change the reliability of Level 4 water supply, and therefore, would not affect native plant communities in the wildlife refuges. There would, therefore, be **no impact** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because an alternate source of Level 4 water supply with Alternative A would not affect plant communities in the refuges, there would be **no impact** on the spread of noxious weed species in the wildlife refuges from water level changes, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with the provision of an alternate source of Level 4 water supply. Therefore, there would be **no impact** to native plants, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because the provision of an alternate source of Level 4 refuge water use would not affect areas of native vegetation, it would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

San Luis Reservoir

San Luis Reservoir currently experiences severe water level fluctuations. Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that operation of the Project would cause San Luis Reservoir water levels to continue to fluctuate, but the fluctuations would occur more often and could be more severe than what currently happens.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Severe water level fluctuations could adversely affect the wetland and riparian scrub vegetation that exists within the tributary drainages in the drawdown zone. However, these patches of vegetation are located in areas that have their own hydrology. The existing vegetation in tributary drainage bottoms within the drawdown zone is already adapted to fluctuating water levels. Increases in such fluctuations could cause some of the small amounts of existing native woody vegetation to die off and be replaced by herbaceous non-native vegetation that can tolerate higher levels of disturbance. Changes or reductions in this vegetation resulting from the more frequent or larger fluctuations associated with implementation of Alternative A would represent a **less-than-significant impact** to existing riparian or wetland vegetation within the San Luis Reservoir drawdown zone, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No native vegetation communities or associated special-status plant species are supported in the drawdown zone of San Luis Reservoir, and no special-status plant species are recorded for this location (DFG, 2010a). Therefore, the changes in surface water elevations at San Luis Reservoir resulting from implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would have a **no impact** on special-status plant species.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Existing large water level fluctuations in the drawdown zone of San Luis Reservoir already spread non-native vegetation around in its available exposed substrate. The more severe changes in surface water elevations at San Luis Reservoir would only reinforce the current disturbance, resulting in a **less-than-significant impact** on invasion or spread of noxious weed species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with fluctuating surface water levels (associated with Project operation) in the Extended Study area at San Luis Reservoir. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or

Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated water level fluctuations at San Luis Reservoir would be within its historical range of operation; therefore, the fluctuations would not conflict with any HCPs, NCCPs, or local plans. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

13.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that operation of the Project would provide operational flexibility to Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. Storage at these reservoirs would be improved in all months of all years, including during May through October in Dry and Critical year conditions. In other years, larger releases would be made to stabilize fall flow conditions. Seasonal and monthly improvements in storage would occur in comparison to Existing Conditions and the No Project/No Action Alternative. In addition to improved storage conditions, operational modeling indicates that these reservoirs would experience a reduced range of change in fluctuations, resulting in less severe drawdowns.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The shorelines of these reservoirs have the potential to support native wetland and lake-edge riparian vegetation. However, the availability of water in the shoreline root-zone decreases as water surface elevation decreases, so changes in reservoir surface water elevation fluctuations have the potential to adversely affect the colonization of native plants. Frequent and severe drawdowns tend to favor the establishment of upland plant communities and disturbance-tolerant non-native plants along the shoreline, rather than native riparian vegetation. The reduction in the reservoir level fluctuations resulting from the implementation of Alternative A has the potential to allow the establishment of native riparian plant communities in these shoreline areas. Therefore, changes in operations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake that would result in improved storage and reduced water level fluctuations would have a **beneficial effect** to native riparian (lake-edge) plant communities and associated native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-status plant species associated with shoreline plant communities or found in upland plant communities close to the water's edge at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake would be expected to be affected by changes in reservoir water levels. Examples could be *Neviusia cliftonii* (Shasta snow-wreath) at Shasta Lake, *Gratiola heterosepala* (Boggs-Lake hedge-hyssop) at Folsom Lake, and *Clarkia* species at Oroville (DFG, 2010a). The native plant communities that these special-status species depend on are most likely to persist intact where water levels do not fluctuate and consequently expose plants to inundation or desiccation. Water level changes also tend to favor the establishment of disturbance-tolerant non-native plants along the shoreline, rather than native vegetation. Therefore, changes in operations resulting from implementation of Alternative A at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake would result in reduced water level fluctuations. These fluctuations are expected to have a **beneficial effect** to special-status species associated with lake-edge native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative, whether those plant communities are riparian/littoral (water dependent) or are in the forest or other upland communities existing in that area prior to construction of the reservoirs.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Existing water level fluctuations in the drawdown zones of Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake spread non-native vegetation around in the available exposed substrate. The less severe changes in surface water elevations at these lakes resulting from implementation of Alternative A would reduce the current disturbance levels, resulting in a **beneficial effect** on the invasion or spread of noxious weed species, when compared to Existing Conditions and the No Project/No Action Alternative. This would mean a reduced likelihood for new arrivals to the area to invade the lake edges, and for existing infestations to spread into the lake arms and other adjacent lands.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with improved storage conditions at these reservoirs. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime or storage conditions of Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake from Project operation would be within the historical range of operations. Therefore, their operations would not conflict with HCPs, NCCPs, or local plans, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex

Operational modeling was performed for Whiskeytown Lake; however, it is expected to operate as it has historically as a regulating reservoir for flow coming through the Clear Creek Tunnel. Operational modeling was not performed for Lewiston Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex (which includes the Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay). They are also expected to continue to operate as they have historically, as regulating reservoirs for upstream reservoirs. No change in operation is expected at any of these reservoirs as a result of Project operation.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Because no change in surface water elevations at Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex is expected, Project operations associated with Alternative A would result in **no impact** on bordering native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because no change in surface water elevations at Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex is expected, when compared to Existing Conditions and the No Project/No Action Alternative, Project operations associated with Alternative A would result in **no impact** on special-status plant species.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because no change in surface water elevations at Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex is expected, when compared to Existing Conditions and the No Project/No Action Alternative, Project operations associated with Alternative A would result in **no impact** on the invasion or spread of noxious weed species.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with operations in the Secondary Study Area at Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, there would be **no impact**.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because no change in operation is expected at any of these reservoirs as a result of Project operations, when compared to Existing Conditions and the No Project/No Action Alternative, there would be no conflict with any HCPs, NCCPs, or local plans and would, therefore, be **no impact**.

Trinity River, Klamath River downstream of the Trinity River, Spring Creek, and Clear Creek

Operational modeling indicates that operations associated with Alternative A would result in little or no change in existing flow regime for the Trinity River, Klamath River downstream of the Trinity River, Spring Creek, and Clear Creek. For the Trinity River, operational modeling indicates that flows would meet or exceed the Trinity River Record of Decision (ROD) requirements in all scenarios, with or without the Project. Project operations could change the timing of flows through the Clear Creek Tunnel, but not the amount supplied. Modeling results show little change from the existing flow schedule, and the small amount of change would rarely occur. For the Klamath River, no flow regime changes are indicated.

Operational modeling was not performed for Spring Creek; Spring Creek runoff is diluted by flows from Whiskeytown Lake through the Spring Creek Tunnel before it enters the Sacramento River. Those flows are diluted again by releases from Keswick Reservoir once they enter the Sacramento River. Operation of the Project would not change operation of Whiskeytown Lake or Keswick Reservoir, and therefore, is not expected to affect the released flows that dilute Spring Creek runoff. For Clear Creek, modeling indicates that flow requirements would be met or exceeded in all scenarios.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Because no change in flow regimes is expected from implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, its operation would result in **no impact** on native stream-edge native plant communities on the Trinity River downstream of Lewiston Lake, on the Klamath River downstream of the Trinity River, on Spring Creek, and on Clear Creek.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to **Impact Bot-1** discussion. That discussion would also be applicable to special-status plant species.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Refer to **Impact Bot-1** discussion. That discussion would also be applicable to noxious weed species.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes in the Secondary Study Area along the Trinity River downstream of Lewiston Lake, on the Klamath River downstream of the Trinity River, on Spring Creek, and on Clear Creek, when compared to Existing Conditions and the No Project/No Action Alternative. Therefore, there would be **no impact**.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Trinity River downstream of Lewiston Lake, the Klamath River downstream of the Trinity River, Spring Creek, and Clear Creek, would be within the historical range of their operations, and would, therefore, not adversely affect native plant species and communities, when compared to Existing Conditions and the No Project/No Action Alternative. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**.

Sacramento River

Operational modeling indicates that Sacramento River flows would meet or exceed the OCAP Biological Opinion requirements with or without the Project. When compared to Existing Conditions and the No Project/No Action Alternative, Alternative A operations would result in changes to the flow regime upstream of the Project diversions as a result of changes in operations at Shasta Lake that result from integration with Project operations. Systematic changes in flows downstream of each of the Project diversions would occur as a result of the combination of the changes in operation of Shasta Lake, as well as the diversion of up to 5,900 cfs at the Project intakes when diversions would occur.

Modeling results indicate that there would be no change in the frequency or severity of flood events, and consequently no large change in the movement of sediment or timing of scour events, as the modeling inputs purposely avoided effects to the river from regulation and diversion when the flow is between 15,000 and 25,000 cfs. For Sacramento River upstream of the Project diversions, Project operations would result in stage fluctuations of approximately -0.6 to 0.5 feet using the Bend Bridge location as the indicator, when compared to Existing Conditions and the No Project/No Action Alternative. September flows would be variable in the amount of increases. Downstream of Project diversions, July and August flow changes would be negligible. Using Wilkins Slough stage as an indicator for this reach, there would be changes in the stage of approximately -2.3 to 2.8 feet if Alternative A is implemented, when compared to Existing Conditions and No Project/No Action Alternative. The reduction in stage would mainly occur in the winter and spring months, when the water is diverted from the Sacramento River to Sites Reservoir; higher stage values occur in the summer and fall months because of the releases from the Sites Reservoir to the river. Fall flows from Shasta Lake to the Project intakes would decrease, but Project releases would stabilize fall flows downstream of the intakes, especially in Dry years.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the valley foothill riparian vegetation alliance along the Sacramento River would increase or remain similar if Alternative A is implemented relative to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modifications to the existing flow regime could affect the establishment of new riparian vegetation or reduce the survival rate of early successional stages of existing riparian vegetation. An increase in river stage has the potential to cause partial inundation of some shrubs. However, the shrubs likely to be affected are already subjected to seasonal inundation, and the increase in river stage during the winter months would fall within the historical range of conditions. Project operational modeling, including modeling that is specific to riparian vegetation, indicates a minimal effect to early or mid-seral stage riparian plant communities (cottonwood forest) resulting from the described changes in the flow regime. Riparian vegetation would not be expected to be adversely affected, when compared to Existing Conditions or the No Project/No Action Alternative.

Modeling results indicate that that there would be no change in the frequency or severity of flood events, and up to a two to four inch increase in winter season river stage. Because the higher winter stage is within the historical range of river stage experienced by existing riparian vegetation, this slight increase is not expected to cause changes in riparian plant communities. River stage in June would be increased four to six inches, which has the potential to prolong wetting of cottonwood seedlings that survive May inundation and scouring. However, this brief increase in root-zone water is unlikely to affect cottonwood establishment rates, considering the much greater effects of earlier scouring and later dessication due to sudden summer dropoff in river stage (Mahoney & Rood, 1998).

It should be noted that, although modeling results indicate that there would be minimal change to riparian vegetation when compared to Existing Conditions or the No Project/No Action Alternative, Existing Conditions are not necessarily favorable for riparian forest, other riparian plant communities, and associated native plant species. Project operations are not expected to aggravate these conditions, but also are not expected to improve them. Therefore, the impact of modifications of the existing flow regime of the Sacramento River resulting from operation of Alternative A would have a **less-than-significant impact** on riparian plant communities along the Sacramento River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Analysis of recorded special-status plant species from within 100 feet of the Sacramento River downstream of Shasta Lake (DFG, 2010a) indicates that there are three special-status plant species that could be affected by changes in flow regime on the Sacramento River between Keswick Dam and the Delta: *Cryptantha crinita* (silky cryptantha), *Hisbiscus lasiocarpos* var. occidentalis (California hibiscus), and *Woffia brasiliensis* (Brazilian watermeal). All other potentially affected species are extirpated (e.g., *Juglans hindsii*, *Trichocoronis wrightii*), or occur only in adjacent upland habitats such as upper-terrace vernal pool landscapes that would not be subjected to river stage changes. The first species, silky cryptantha, is known only from gravel bars on tributaries of the Sacramento River, well away from the mouth, and would not be affected by the seasonal stage changes expected from operation of Alternative A.

The California hibiscus has been reported along the river edge only from the southern end of the valley in Sutter and Sacramento counties, and is not likely to experience any effects of the June four- to six-inch stage increase from Project operations. The Brazilian watermeal is known from one river site near Chico in an off-channel slough; it has been observed there through November, so a slight temporary increase in river stage in June is unlikely to affect this species of calm backwaters. One other species, *Carex comosa* (bristly sedge) is known from marshy areas in the Delta and Shasta County but not along the Sacramento River edge. Therefore, the impact of modifications of the existing flow regime of the Sacramento River resulting from operation of Alternative A would have a **less-than-significant impact** on special-status plant species along the Sacramento River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Existing water level fluctuations along the banks of the Sacramento River already spread non-native vegetation downstream along exposed banks, especially after high flow events when fresh silt and seed are deposited on banks. The expected slight seasonal changes in surface water elevations resulting from implementation of Alternative A would only reinforce the current disturbance and continue the existing spread of bordering non-native vegetation, and therefore, would have a **less-than-significant impact** on the invasion or spread of noxious weed species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes in the Secondary Study Area along the Sacramento River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Sacramento River would be within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Feather River

Operational modeling indicates that Feather River flows would meet or exceed the FERC Settlement Agreement's minimum flow requirements in all scenarios, with or without operation of the Project. The operational flexibility provided by the Project would result in a Feather River flow regime that would be less reactive to Delta conditions during summer and fall months. Consequently, when compared with Existing Conditions and the No Project/Action Alternative, flows in June through September in drier years would be improved. However, flows would generally be decreased during October, November, and December.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The higher Feather River flows that are currently released during summer months to improve Delta conditions (i.e., Existing Conditions) have the tendency to scour or inundate riparian vegetation, preventing growth of mature woody riparian vegetation (DWR, 2007). Implementation of Alternative A would return the river to a flow regime that is more stable during summer and fall months. Lower and more stabilized flows would reduce the risks of these adverse effects on riparian vegetation growth. The lower summer flows resulting from implementation of Alternative A would not likely have a substantial adverse effect on established riparian vegetation, and could be beneficial in drier years when flows would be higher than Existing Conditions and the No Project/No Action Alternative. The reduced summer flows would also not be likely to adversely affect the hydrology of backwater habitats, and the resulting reduction in the velocity and temperature of the river flows could be beneficial to some native vegetation. Because the modification of the existing flow regime in the Feather River from implementation of Alternative A is not expected to adversely affect riparian vegetation, the expected changes would have a **less-than-significant impact** on native vegetation on the Feather River downstream of Lake Oroville, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because modification of the existing flow regime in the Feather River resulting from implementation of Alternative A is not expected to adversely affect riparian vegetation, and may benefit native plant communities along the water's edge, riparian-associated plant species are not expected to be adversely affected. Therefore, the expected changes to the flow regime would have a **less-than-significant impact** on riparian-associated special-status plant species on the Feather River downstream of Lake Oroville, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

The higher Feather River flows that are currently released during summer months to improve Delta conditions (i.e., Existing Conditions) have the tendency to scour or inundate riparian vegetation, tending to result in colonization of non-native species that are tolerant of repeated disturbance (DWR, 2007). Lower and more stabilized flows associated with implementation of Alternative A would reduce the risks of this adverse effect. Therefore, the expected changes to the flow regime would have a **less-than-significant impact** on the spread of noxious weed species on the Feather River downstream of Lake Oroville, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime in the Secondary Study Area along the Feather River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Feather River would be within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sutter Bypass and Yolo Bypass

Operation of Alternative A would result in the diversion of up to 5,900 cfs from the Sacramento River during winter flows. These diversions would occur at the T-C, GCID, and Delevan Pipeline intakes, all of which are (or would be) located upstream of, and therefore, would affect the hydrology of, both the Sutter and Yolo bypasses. The spills into the Sutter Bypass would consequently be reduced by up to 5,900 cfs, which would reduce the velocity and volume of incoming water, and could delay the point at which the weirs begin to spill. Likewise, operational modeling indicates that that there would be a reduction in the duration and magnitude of flows entering into the Yolo Bypass if Alternative A is implemented.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Approximately 80 percent of the Sutter NWR is located in the Sutter Bypass, and the Yolo Bypass includes the Yolo WA. The riparian and floodplain wetland habitats within both the Sutter and Yolo bypasses support numerous species of native (and non-native) plants that are adapted to various degrees of inundation, and occur in various patterns relative to receding floodwaters. A reduction of the velocity and volume of floodwaters entering the bypasses from the Sacramento River would reduce the amount of flooding that the NWR and WA experience; the Sutter NWR can at times be covered with up to12 feet of water. If Alternative A is implemented, reduction in the velocity and volume of water could benefit riparian and wetland vegetation by reducing the duration of inundation and the amount of seedling scour that occurs during high flows. Therefore, the modification of the existing flow regime of the Sutter and Yolo bypasses that would result in reduced velocity and volume of incoming floodwaters would be a **potentially beneficial effect** to native plant communities and native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

One special-status plant species, currently known to exist at or adjacent to the edges of the Sutter Bypass, and four special-status species known to occur in the interior of the Yolo Bypass, are described in the Bypass impact analyses for the No Project/No Action Alternative. Assuming possible increased longevity in the Sutter and Yolo bypass water-related native plant communities due to expected flow modifications, operation of Alternative A would have a **potentially beneficial effect** on special-status plant species associated with Sutter and Yolo bypass riparian or wetland plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Assuming possible decreased scouring and increased longevity in the Sutter and Yolo bypass' stream-edge and interior wetland native plant communities, due to expected reduced flow levels and velocities, operation of Alternative A would reduce the invasion or spread of noxious weed species in the two bypasses, resulting in a **potentially beneficial effect**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime in the Secondary Study Area in the Sutter and Yolo bypasses. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Sutter and Yolo bypasses would be within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

American River

Operational modeling indicates that operation of Alternative A would have effects on the American River that are similar to those described for the Feather River. The operational flexibility provided by implementation of Alternative A would result in an American River flow regime that would be more consistent with hydrologic conditions, rather than reactive to Delta conditions. Consequently, when compared to Existing Conditions and the No Project/No Action Alternative, flows would generally be decreased during June through September with the largest reductions in July. However, in drier years, flows would be improved from June through September when compared to the No Project/No Action Alternative.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The channel edges and backwater sloughs of the American River support mature riparian forests, as well as early to middle seral-stage riparian vegetation. Modifications to the existing flow regime of the American River have the potential to adversely affect these native plant communities. However, operation of Alternative A would return the river to a flow regime that is more stable during summer months. Under Existing Conditions, the higher flows that are released during summer months to improve Delta conditions have the potential to scour or inundate riparian vegetation. Lower and more stabilized flows would reduce risks of scouring. The lower summer flows associated with implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian vegetation, and could be beneficial in drier years when flows in June through September would be higher than for the No Project/No Action Alternative. Consequently, flow regime modifications resulting from implementation of Alternative A would have a **less-than-significant impact** on riparian native plant communities along the American River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

As indicated in **Impact Bot-1**, the lower summer flows associated with implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian vegetation, and could be beneficial in drier years when June through September flows would be higher than for the No Project/No Action Alternative. Consequently, flow regime modifications would not be likely to have a substantial adverse effect on special-status plant species associated with riparian vegetation. Therefore, flow regime modifications resulting from implementation of Alternative A would have a **less-than-significant impact** on riparian-associated special-status plant species along the American River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

As indicated in the **Impact Bot-1** discussion, operation of Alternative A would return the river to a flow regime that is more stable during summer months, reducing the area of exposed banks that are vulnerable to weed invasions. Flow regime modifications resulting from implementation of Alternative A would, therefore, have a **less-than-significant impact** on the invasion or spread of noxious weed species along the American River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes in the Secondary Study Area along the American River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the American River would be within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento-San Joaquin Delta

Operational modeling indicates that operation of Alternative A would result in a flow reduction in the Delta in December and January, resulting in a one to two kilometer shift in the position of X2. However, this shift would occur during wet months when X2 position is well within compliance of salinity standards for the Delta, and would, therefore, fall within the historical range of species tolerance for plant and animal life. Project operational modeling also indicates an improvement in salinity conditions in August through October, and increased inflows into the Delta during Critically Dry years.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modification of the flow regime associated with implementation of Alternative A would result in a shift in the X2 position that would still be within the historical range of tolerance of existing native plant communities. In addition, Delta salinity would be reduced in August through October, as well as in Critically Dry years. These conditions would result in a **less-than-significant impact** on native plant communities in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The conditions described in the **Impact Bot-1** discussion that would occur from implementing Alternative A would result in a **less-than-significant impact** on special-status plant species in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

The conditions described in the **Impact Bot-1** discussion that would occur from implementing Alternative A would result in a **less-than-significant impact** on the invasion or spread of noxious weed species in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime in the Secondary Study Area within the Delta, so there would be no human disturbance associated with these activities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Delta would be within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Suisun Bay

Operational modeling indicates that the diversions associated with Alternative A would substantially increase electrical conductivity (EC) (a measure of salinity levels) in the Suisun Marsh in December. However, for Existing Conditions and the No Project/No Action Alternative, EC would be very low in December, so the substantial increase in EC associated with implementation of Alternative A would result in overall EC levels that would be within the historic range of species tolerance.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Modifications to the existing flow regime of the bay and marsh could potentially result in adverse effects to Suisun Bay's and Marsh's extensive native wetland plant communities. However, because the modification of the flow regime associated with operation of Alternative A would result in an increase in Suisun Bay EC that would be within the historic range of tolerance of the plant communities, there would be a **less-than-significant impact** on native plant communities in Suisun Bay and Marsh, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The extensive native wetland plant communities of Suisun Bay and Marsh support many endemic and special-status plant species. Modifications to the existing flow regime of the bay and marsh could adversely affect these special-status species. However, because the modification of the flow regime associated with operation of Alternative A would result in an increase in Suisun Bay EC that would be within the historic range of tolerance of species, there would be a **less-than-significant impact** on special-status species in Suisun Bay and Marsh, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Modifications to the existing flow regime of the bay and marsh could potentially create conditions more favorable to non-native or invasive plant species. However, because the modification of the flow regime associated with operation of Alternative A would result in an increase in Suisun Bay EC that would be within the historic range of tolerance of species in existing plant communities, there would be a **less-than-significant impact** on the invasion or spread of noxious weed species in Suisun Bay and Marsh, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime in the Secondary Study Area within the Suisun Bay and Marsh, so there would be no human disturbance associated with these activities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Suisun Bay and Marsh would fall within the historical range of operation and would not adversely affect native plant species and communities. Consequently, these changes would not conflict with any HCPs, NCCPs, or local plans and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

San Pablo Bay and San Francisco Bay

Operation of Alternative A is not expected to affect the hydrology of San Pablo and San Francisco bays.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Because there would be no effect on hydrology within San Pablo or San Francisco bays from operation of Alternative A, there would be **no impact** to bordering native plant communities along edges of the bays, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because no effect on hydrology from operation of Alternative A is expected within San Pablo or San Francisco bays, there would be **no impact** to special-status plant species along edges of the bays, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because there would be no effect on hydrology within San Pablo or San Francisco bays from operation of Alternative A, there would be **no impact** on the invasion or spread of noxious weed species along edges of the bays, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes in the Secondary Study Area within San Pablo and San Francisco bays, so there would be no human disturbance associated with these activities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because Project operation is not expected to affect the flow regime of San Pablo and San Francisco bays, there would be no conflict with any HCPs, NCCPs, or local plans and would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

13.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area and Sites Reservoir Dams

The construction of a 1.27-MAF Sites Reservoir would also require the construction of Sites Dam, Golden Gate Dam, and seven saddle dams. Construction-related ground-disturbing activities, vegetation removal, and the subsequent filling of the reservoir, would result in the direct and permanent loss of native plant communities and special-status plants within the inundation area, i.e., facility footprint (Table 13-13). Varying extents of several vegetation communities would be replaced by either standing water or sterile subsoil.

Table 13-13
Permanent Vegetation Loss Due to the Construction of the 1.27-MAF Sites Reservoir and Associated Dams: Alternative A

Vegetation Type	Permanent Loss (Acres)
Annual grassland	11,654.6
Blue oak woodland	182.3
Blue oak savanna	163.1
Blue oak/mixed chaparral	8.1
Cropland	267.9
Ponds	20.2
Urban/disturbed	76.1
Valley foothill riparian	64.0
Valley oak riparian	17.5
Valley oak woodland	3.4
TOTAL	**12,457.2**

Vegetation located outside of the facility footprint would also be temporarily disturbed during Project construction. This construction disturbance area would be located on the north and east sides of the reservoir in the vicinity of Sites and Golden Gate dams, and could consist of as much as 1,000 additional acres of land. The majority of vegetation that would be disturbed in those areas is annual grassland, but valley foothill riparian, and possibly wetland vegetation within the grasslands, could also be disturbed. Disturbed areas would be restored to their original habitat type following completion of construction.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

The grassland landscape in and around the Sites Reservoir footprint supports some vernal pools and other vernally wet areas; for impacts to these and other wetland features, refer to Chapter15 Wetlands and Other Waters of the U.S. Construction of Sites Reservoir would result in the permanent loss of annual grassland, as described below.

Valley Edges

Although the grassland in the Sites Reservoir footprint area is mostly highly disturbed, the hillslopes around the footprint edges support a more diverse flora. The hillslopes around the Sites Reservoir footprint fall within the grassland-blue oak woodland edge. Because the floor and the edges of the reservoir footprint are comprised of grasslands of such different ecological and botanical value, it is useful to distinguish them in terms of degree of impact from the Project. The loss of approximately 2,500 acres of footprint-edge (moderately high quality) annual grassland would be a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Floor

In contrast to the reservoir edges, the reservoir footprint floor has been subject to such intensive human use that it is unlikely to have the capacity to support botanically rich or diverse native grassland in the foreseeable future. A substantial acreage of this valley floor is also often converted to hayfields, pasture and other agricultural uses from time to time, and other parts have been heavily grazed for many decades. Loss of over 9,000 acres of highly disturbed (very low quality) annual grassland in the footprint floor would be a **less-than-significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Salt Lake Wetlands

An exception to the botanically degraded Sites Reservoir footprint is the Salt Lake saline/alkaline wetland area, including additional seasonal vernally wet flats both upstream and downstream of the existing Salt Lake impoundment. Along with other wetland features, this area was mapped as part of the Annual Grassland community which surrounds it, and its acreage (approximately 20 acres) is included within the “annual grassland” type. Salt Lake and the adjacent flats are fed by warm saline springs that are also within the 520 foot expected water surface elevation of the Sites Reservoir. Inundation of the Salt Lake area would represent permanent loss of a rare habitat supporting unique saline-substrate flora. The related “Alkaline Meadow” vegetation association has a State Rank of 2.1 - “Imperiled by rarity due to very restricted range, steep declines, and other factors” (CNPS, 2011). Although the Salt Lake area is currently heavily compacted and disturbed by cattle, occasional representatives of the saline flora were found during Project surveys, indicating that the saline/alkaline habitat can support this suite of species. The loss of this saline/alkaline wetland vegetation would be a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative. For more detail on this long-term direct loss, refer to Chapter 15 Wetlands and Other Waters of the U.S.

Construction Staging Area

Disturbance to, and partial loss of, up to 1,000 acres of grassland outside of the Sites Reservoir footprint to the east and northeast due to reservoir and dam construction activities would occur in an area (in the northeast) containing seasonal wetlands. Some of this grassland, although also disturbed, is less disturbed than the interior of the reservoir footprint, and part of a vernal pool-seasonal wetland landscape. Therefore, losses of grassland in the reservoir's construction disturbance area could have a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodland, blue oak savanna, and blue oak/mixed chaparral would be permanently lost from filling the Sites Reservoir. These wooded vegetation communities, mostly concentrated around the western and some southeastern edges of the reservoir footprint, support some of the most diverse native flora in the vicinity. They also represent a dwindling vegetation type in California, as more acres of blue oak woodlands are urbanized, converted to wine-grape vineyards, or cut for firewood, with slow to no regeneration in many grazed areas (U. C., 2007; U.C., 2008; U.C., 2011). The loss of more than 180 acres of blue oak woodland would be a **significant impact** to this inner coast-range foothills plant community, when compared to Existing Conditions and the No Project/No Action Alternative. Likewise, the loss of more than 160 acres of blue oak savanna and approximately eight acres of blue oak woodland supporting a substantial mixed-chaparral understory would each be a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Vegetation

Construction of Sites Reservoir would result in the permanent removal of riparian vegetation. Approximately 64 acres of valley-foothill and 17 acres of valley-oak riparian vegetation would be removed by clearing and filling of the 1.27-MAF Sites Reservoir. The riparian vegetation would be lost from mostly small (0.1- to 1-acre) fragments of woody streamside vegetation in highly disturbed and interrupted narrow ribbons along the edges and banks of Funks, Grapevine, and Antelope creeks. The largest areas (all under 3 acres in size) of well-developed riparian vegetation that would be lost are in the northwest part of the reservoir footprint along Grapevine Creek. The 81-acre total of riparian vegetation represents a remnant of these communities along watercourses in the Antelope Valley. Loss of any one of these small areas of riparian woodland and associated mixed native and non-native shrub and herbaceous flora would be a **less-than-significant impact** to native plant communities in this part of the state, when compared to Existing Conditions and the No Project/No Action Alternative. However, the loss of the 81 acres, combined with the additional acres subject to disturbance in the construction staging area, would be a **potentially significant impact** to this vegetation community that is already greatly diminished in the state (SRCAF, 2003) and recognized as a sensitive habitat (DFG, 2010a), when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Oak Woodland

Construction of Sites Reservoir would result in the permanent removal of valley oak woodland. Approximately 3.4 acres of valley oak woodland would be removed by construction and filling of the 1.27-MAF reservoir. The valley oak woodland occurs in small sites each smaller than 1.5 acres, and is in some cases a mixture of valley oak and other (possibly non-native) tree species such as walnut. The 3.4 acres of valley oak woodland lost to the reservoir footprint represent 100 percent of this vegetation type in the vicinity of the reservoir. Because this vegetation type is considered "Imperiled by rarity due to very restricted range, steep declines and other factors" (State Rank 2.1) (CNPS, 2011), its loss would be a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Agricultural fields, ponds, and urban/disturbed land support almost no native flora. The exceptions are a few of the stock ponds, which are mostly unvegetated, but in some seasons support small amounts of water-dependent vegetation. However, field observations indicate that most of this vegetation is also non-native (e.g., dock, cocklebur, and similar species). Construction impacts to these vegetation types would represent a **less-than-significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

CNPS List 1B and State- or Federally Listed Species

Construction and filling of the 1.27-MAF Sites Reservoir would result in no loss of known occurrences of any CNPS List 1B species or State- or federally listed species. However, two species with suitable habitat around the reservoir footprint edges were likely not adequately included in the reservoir footprint surveys of 1998-99, and therefore, may occur within the footprint: *Amsinckia lunaris* (AMLU - CNPS List 1B) and *Sidalcea keckii* (SIKE - CNPS List 1B and federally endangered). The possibility of these species occurring in the Project vicinity was reported after surveys were completed (2000 for AMLU when it was discovered adjacent to Project feature footprints, and 2008 for SIKE when specimens from an adjacent site were annotated to this taxon). It is possible that one or both occur in the similar habitat of grassland slopes within blue oak savanna or just downslope from blue oak woodland, located around the western and southeastern edges of the Sites Reservoir footprint. It is possible that these rare species were observed during the 1998-99 Project surveys, but entered to the species inventory list under the name for the common look-alikes (i.e., *Amsinkia intermedia* for AMLU, *Sidalcea diploscypha* for SIKE), for which occurrence locations are not documented. Because surveys targeting these species have not been completed, their presence must be assumed. Loss of occurrences of one or both of these rare species would be a **significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

One occurrence of an additional CNPS List 1B species, *Lotus rubriflorus* (LORU), is located approximately 150 feet uphill from the maximum expected water surface elevation for the 1.27-MAF reservoir footprint. Although outside of the reservoir's inundation area, this rare occurrence could easily be disturbed or destroyed by Project construction or recreation activities. The disturbance or loss of this species would be a **significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

CNPS List 4 Species

Construction and filling of the 1.27-MAF Sites Reservoir would result in the loss of 13 occurrences of four CNPS List 4 species: two occurrences of *Androsace elongata* ssp. *acuta* (fairy candelabra); five of *Hesperevax caulescens* (hogwallow starfish), one of *Navarretia eriocephala* (hoary navarretia), and five of *Navarretia heterandra* (Tehama navarretia). The latter three species are fairly common in vernally moist clay-soil grasslands in the Inner Coast Range foothills. Fairy candelabra is less common, and in fact, is not known from Glenn or Colusa counties prior to Project surveys. Although CNPS List 4 plants are not the rarest of California's special-status plants, they are considered uncommon (have a limited distribution) in California. For example, the fairy candelabra is considered vulnerable and possibly threatened in California (State Rank S3.2); in the Inner Coast Range foothills, it is found in a very restricted habitat of north-facing crumbly shale slopes. The *Hesperevax* and the two *Navarretias* both require heavy adobe clay soil and flat to gently sloping grasslands with very little thatch buildup. The hoary navarretia occurrences found during Project surveys are the northernmost recorded for the species. The 13 occurrences of all four species are located around the western and southeastern edges of the proposed Sites Reservoir footprint, at or near the grassland-blue oak woodland edge, often on or at the base of gentle hillslopes. The permanent loss of these CNPS List 4 occurrences would be a **potentially significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

During filling of Sites Reservoir and after it reaches full pool, it is possible that on some of the more gently sloping hillsides, especially within concave drainage areas, water-related vegetation that does not now occur in the Antelope Valley could grow. Most of this vegetation would be ephemeral, due to fluctuations in water levels. The added groundwater pressure of the reservoir could induce not only this type of annual riparian or wetland vegetation, but also some scattered annual herbaceous growth in fill-line-related bands around the barren draw-down zone, or "bath-tub ring". Much of this volunteer growth would be non-native species that responds to infertile, continually disturbed soil conditions. The reservoir footprint would thus become a productive substrate for many invasive species already occurring in the area, as well as others that have not yet invaded (e.g., thistles, bindweed, cocklebur, amaranth, and other species typical of reservoir edges). These populations would become a potential seed source for further invasion of surrounding grasslands and foothill environments, which would have a **potentially significant impact** on the invasion or spread of noxious weed species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Native plants may be directly or indirectly affected by dust generated from Project-related construction, operation, and maintenance, and recreation activities associated with the proposed Sites Reservoir and Dam. Construction activities would include the use of large equipment, and would result in temporarily increased dust, which could coat plants and lead to short-term decreased vigor in occurrences of native plants, including special-status plants potentially growing within 100 feet of the reservoir maximum expected water surface elevation. However, due to its temporary nature the human disturbance associated with construction, operation, and maintenance of these facilities would have a **less-than-significant impact** on native plants adjacent to the reservoir and dams, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

The Primary Study Area is not included in any HCPs or NCCPs. The Colusa County Voluntary Oak Woodlands Management Plan provides guidelines for voluntary participation, and Project mitigation for oak woodlands would exceed those guidelines. Therefore, there is no conflict with this plan and consequently **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas and Associated Electrical Distribution Lines

The Antelope Island, Lurline Headwaters, Stone Corral, Peninsula Hills, and Saddle Dam recreation areas all have footprints that represent the total area within which land-based recreation could occur. However, only approximately 15 percent of each footprint (approximately 175 acres total) would experience a permanent loss of vegetation cover as a result of the construction of facilities, such as boat ramps, picnic areas, roads, fire rings, restroom facilities, and campgrounds. The remainder of the acreage within each recreation area footprint could experience indirect impacts from ongoing recreational activities.

Three of the recreation areas also have associated electrical distribution lines. The total acreage of plant communities affected by each recreation area and its associated electrical distribution line is presented in Table 13-14.

Table 13-14
Permanent Vegetation Loss and Temporary Disturbance Due to the Construction of Recreation Areas and Associated Electrical Distribution Lines: Alternative A

Vegetation Type	Total Number of Acres Affected						
	Saddle Dam[a]	Peninsula Hills[a]	Stone Corral	Antelope Island	Lurline Headwaters[a]	TOTAL Disturbance	Permanent Loss[b]
Annual grassland	271.6	78.2	132.8	12.3	79.2	**574.1**	86.1
Blue oak woodland	0.0	115.3	102.3	20.3	96.4	**334.3**	50.0
Blue oak savanna	0.0	185.9	0.0	13.5	48.2	**247.6**	37.0
Blue oak/mixed chaparral	0.0	0.0	0.0	3.1	11.6	**14.7**	2.2
Chamise	0.0	0.0	0.0	0.0	1.0	**1.0**	0.2
Ponds	1.2	0.0	0.0	0.0	0.0[c]	**1.2**	0.2
TOTAL	**272.8**	**379.4**	**235.1**	**49.2**	**236.4**	**1,172.9**	**175.7**

[a]Acreage includes construction disturbance area for associated electrical distribution line.
[b]Permanent loss is calculated as 15 percent of the total construction disturbance area.
[c]This recreation area footprint has a pond with a total area of less than 0.1 acre

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

Annual grasslands within the footprints of the proposed Antelope Island, Lurline Headwaters, Stone Corral, and Peninsula Hills recreation areas have similar value to native plant communities as the “edge” grasslands described in the impact assessment for Sites Reservoir and Dams. This grassland is relatively high quality because it is much less disturbed than grassland located within the reservoir footprint, has remnant native bunchgrass components, and is at or within the grassland-blue oak woodland edge. Annual grassland in the Saddle Dam Recreation Area footprint is also high quality, despite its grazing history and lack of blue oak woodland, because it is part of a surrounding landscape with abundant seasonal wetlands, vernal pools and saline/alkaline wetlands. The potential disturbance of up to 574 acres and permanent loss of approximately 86 acres of annual grasslands in these recreation area footprints during construction of the recreation areas would represent a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodlands within the footprints of the proposed Antelope Island, Lurline Headwaters, Stone Corral, and Peninsula Hills recreation areas and their associated transmission lines vary from savanna to woodland, with and without a substantial mixed chaparral understory. These woodlands are of the same value to native plant communities as those described in the impact assessment for Sites Reservoir and Dams. All types of blue oak woodland in these recreation area footprints are high quality because they have not been heavily grazed. The potential disturbance of up to almost 600 acres and the permanent loss of 89 acres of blue oak woodlands around the slopes above Antelope Valley during construction of the recreation areas would represent a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Chamise

Chamise shrubland occurs within the transmission line route for the Lurline Headwaters Recreation Area. This densely vegetated plant community is very common in the Coast Range and has a low diversity of native plant species. Potential disturbance of one acre and virtually no permanent loss of chamise on these slopes above Antelope Valley during construction of the recreation areas would represent a **less-than-significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Ponds support almost no native flora. The ponds are stock ponds, which are mostly unvegetated, but may in some seasons support small amounts of water-dependent vegetation. However, field observations indicate that most of this vegetation is also non-native (e.g., dock, cocklebur, and similar species). Construction impacts to this vegetation type would represent a **less-than-significant impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

CNPS List 1B and State- or Federally Listed Species

No habitats for, or occurrences of, any of the vernal pool-related special-status plant species occur in the five recreation area footprints, so there would be **no impact** on these species, when compared to Existing Conditions and the No Project/No Action Alternative. Suitable habitat for the special-status plant species associated with heavy clay or crumbly clay-loam hillside oak woodland/grassland edges (*Fritillaria pluriflora, Amsinckia lunaris, California macrophylla*, or *Lotus rubriflorus*) occurs in most or all of the recreation areas and associated distribution line footprints. The federally endangered *Sidalcea keckii* is also potentially present. No occurrences of the first four species were found during Project surveys.

One small occurrence of *Lotus rubriflorus* was found in the footprint of the Peninsula Hills Recreation Area during Project surveys. All or part of this small occurrence, found just above the western 520-foot contour above Antelope Valley, would likely be lost, either from direct destruction during construction of Sites Reservoir, or construction of recreation areas within the reservoir footprint, because the occurrence is located where the two footprints meet. *Lotus rubriflorus* was not known from the Sites Reservoir area prior to Project surveys. The two nearest known occurrences were seven miles west of the reservoir footprint, and more than 40 miles to the northeast. However, during Project surveys, an abundant occurrence of *L. rubriflorus w*as discovered approximately four miles southwest of the Peninsula Hills Recreation Area footprint along Grapevine Creek. Loss of the one small occurrence at the Peninsula Hills Recreation Area edge would diminish the numbers of *L. rubriflorus* in this part of its range to a minor degree, which would have a **potentially significant impact** on this special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Sidalcea keckii, Amsinckia lunaris or *California macrophylla* can be easily overlooked or misidentified. The *Amsinckia* was not included on the 1998 to 2000 survey search lists, and some parts of some of the recreation area footprints were not surveyed. The *Sidalcea* was not included on any of the survey search lists because it was thought to be either extinct or to occur only in southeastern California. Therefore, it is possible that occurrences of one or all three species exist in the Antelope Island, Stone Corral, Peninsula Hills, or western portion of Lurline Headwaters recreation areas, and could be affected by construction of the recreation areas. Loss or disturbance to any of these three species would be a **potentially significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative, because very few occurrences of these species are known from the portion of their ranges near proposed Project features.

It should be noted that some adverse effects to occurrences of special-status plant species in adjacent lands could occur due to competition and habitat alteration resulting from invasion of noxious weed species (refer to the **Impact Bot-3** discussion). The known occurrences that could be affected are those of *Amsinckia lunaris* and *California macrophylla* in the hills 0.2 to 0.3 mile west of the Peninsula Hills Recreation Area. Other as yet undiscovered occurrences of these species, and possibly *Lotus rubriflorus* or *Sidalcea keckii*, could also be affected if they exist in lands surrounding the recreation areas.

CNPS List 4 Species

Although habitats for some of the CNPS List 4 species exist in the recreation area footprints, no occurrences of these species were found during Project surveys, so **no impact** is expected to these special-status plant species from construction of recreation areas or recreational use of the areas, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance in the grasslands and open blue-oak woodland slopes of the recreation area footprints would result in many small edges and areas of bare soil. On their own, these disturbed areas would revegetate with mostly non-native annual plant species, with high potential for spread or new colonization by common noxious weeds in the surrounding foothills and valley, such as yellow star-thistle, Italian plume-thistle, barbed goat-grass, mustards and milk thistle. Revegetation by native species in disturbed ground is very unlikely, due to the rapid growth rates and other superior competitive abilities of most invasive weedy species. Therefore, even temporary disturbance of up to 1,000 acres of land while constructing the five recreation areas, as well as potential ground-disturbance associated with recreational activities during operation, and maintenance activities such as road grading, would increase the probability of the spread of noxious weeds. These weed populations would not only displace native vegetation, but would then become a potential seed source for further invasion of surrounding grasslands and foothill environments, which would have a **potentially significant impact** on the remaining native vegetation, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Native plants may be directly or indirectly affected by Project-related construction, operation, and maintenance, and recreation activities associated with the five proposed recreation areas. Indirect impacts from increased human use and vehicle traffic would affect some portion of the grasslands and woodlands. Construction activities would include the use of large equipment, and would result in temporarily increased dust, which could coat plants and lead to short-term decreased vigor in occurrences of native plants. Potential indirect impacts also include introduction of noxious weeds, death of shrubs or trees from disruption of water sources or drainage patterns, disturbance or destruction of bulbs and roots by digging pets, disturbance of plants, and degradation of soil by off-road vehicle compaction. Indirect impacts from human recreational activities, such as hiking, camping in undesignated areas, and off-road vehicle or mountain bike use, and from human trampling could erode and introduce weeds into much of the area surrounding the facilities. Because special-status plant species not included in Project surveys may occur in at least four of the five recreation area footprints, human disturbance could have a **potentially significant impact** on native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Road Relocations and South Bridge

The road relocations and South Bridge include portions of the existing Huffmaster, Peterson, Maxwell Sites, Sites Lodoga, and private property roads; new access roads to facilities, such as recreation areas and dams; connections between existing and new roads; and an approach to a new bridge.

The 200-foot-wide construction disturbance area includes the surface areas of more than 35 miles of roads, the associated shoulders and cut and fill slopes, plus additional area for equipment staging and other construction activities. Both sides of the roads are proposed to be fenced. Construction of the road relocations and South Bridge would result in direct and permanent loss of existing vegetation within the entire construction disturbance area, as well as some temporary loss. Areas disturbed only during Project construction would be allowed to return to their original vegetation cover following completion of construction. Acreage for the South Bridge is not included in this analysis because the bridge would not have an on-the-ground footprint. The construction disturbance area for the bridge would fall within the footprint of Sites Reservoir, and is, therefore, already accounted for in the permanent loss of habitat associated with the reservoir.

Of the 200-foot total construction disturbance area width, an approximate average of 60 feet (30 percent) would result in the direct and permanent loss of native plant communities and other land cover resulting from the footprint of the roads and the required cut and fill. The permanent loss of habitat would, therefore, be approximately 285 acres. The majority of the acreage affected by construction of the roads would be annual grassland and blue oak woodlands.

The acres of each vegetation type that would be affected by the road relocations and South Bridge are listed in Table 13-15.

Table 13-15
Permanent Vegetation Loss and Temporary Disturbance Due to the Construction of the Road Relocations and South Bridge: Alternative A

Vegetation Type	Total Number of Acres Affected	Permanent Loss* (Acres)
Annual grassland	719.9	216.0
Blue oak woodland	98.9	29.7
Blue oak savanna	84.6	25.3
Blue oak/mixed chaparral	12.3	3.7
Canal	0.6	0.2
Chamise	1.5	0.4
Cropland	15.9	4.8
Mixed chaparral	2.6	0.8
Pond	0.5	0.2
Urban/disturbed	9.7	2.9
Valley foothill riparian	4.0	1.2
Valley oak riparian	0.2	0.1
TOTAL	**950.7**	**285.3**

*Permanent loss is calculated as 30 percent of the total construction disturbance area.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

Annual grasslands within the footprint and construction disturbance area of the proposed road relocations have similar value to native plant communities as the “edge” grasslands as described in the impact assessment for Sites Reservoir and Dams. This grassland is relatively high quality because it is much less disturbed than the grassland in the reservoir footprint, has remnant native bunchgrass components, and is at or within the grassland-blue oak woodland edge. Annual grassland in the road relocation footprint of the North Road to Saddle Dam Road is also high quality, despite its grazing history and lack of blue oak woodland, because it is part of a surrounding landscape with abundant seasonal wetlands, vernal pools and saline/alkaline wetlands. The road relocation route in this area would be immediately adjacent to several wetland features within surrounding grasslands. Disturbance of up to 719 acres of moderately high quality annual grasslands, of which approximately 285 acres would be a permanent loss, due to construction of the proposed road relocations would represent a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodlands within the footprint and construction disturbance area of the road relocations vary from savanna to woodland both with and without a substantial mixed chaparral understory. These woodlands are of the same value to native plant communities as those described in the impact assessment for Sites Reservoir and Dams and for four of the five Recreation Areas. All types of blue oak woodland in the road route disturbance area are high quality because they have not been heavily grazed, and their grassland edges are potential habitat for special-status plant species. The road disturbance area contains almost 100 acres of blue oak woodland (very little shrub understory), approximately 85 acres of more open blue oak savanna, and approximately 12 acres of blue oak woodland with a substantial mixed chaparral understory. Temporary disturbance of blue oak woodlands of any type can result in long-term or permanent conversion to another type of vegetation cover (usually of weedy grassland or shrubland), due to the slow and problematic regeneration of blue oak as a species. The disturbance and potentially permanent loss of up to almost 200 acres of blue oak woodlands from road relocation construction would represent a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Chamise

Chamise shrubland within the footprint and construction disturbance area of the road relocations occurs only within the route serving the Communication towers north of the Lurline Headwaters Recreation Area (Com Road). The densely vegetated chamise shrubland plant community is very common in the Coast Range and has low diversity of native plant species. Areas temporarily disturbed during Project construction activities in the disturbance area would be likely to revegetate readily with chamise. The permanent loss of approximately 0.4 acre of chamise on these slopes above Antelope Valley during road construction would be less than one percent of the 114 acres of this plant community mapped east of Logan Ridge in the Project vicinity. The chamise community is very common in the main ridges of the Coast Range. Therefore, this loss would represent a **less-than-significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Mixed Chaparral

Mixed chaparral shrubland within the footprint and construction easement of the road relocations occurs only within the route serving the south end of the reservoir (Sulfur Gap Road to Lurline Road to Huffmaster Road segment). The densely vegetated chaparral plant community is not potential habitat for any special-status species. Mixed chaparral is very common in the Coast Range, although not common on the east side of Antelope Valley. Its edges can support a high diversity of native plant species, some unique to chaparral. The 2.6 acres that would be temporarily disturbed during construction activities in the corridor would likely revegetate readily with chaparral species. The permanent loss of 0.8 acre of mixed chaparral represents approximately seven percent of the 11.8 acres of this plant community mapped on these slopes above the east edge of Antelope Valley. Construction activities in the road relocation corridor would result in a **less-than-significant impact** to native plant communities and associated native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Vegetation

Riparian woodland, either mixed species or dominated by valley oak, within the footprint and construction disturbance area of the road relocations occurs in various locations around the Primary Study Area where the road route crosses Funks, Lurline, Antelope, and unnamed creeks. Although this plant community is not potential habitat for any special-status species, it is an ecologically important and sensitive plant community and potentially supports a unique set of native plant species. Disturbance to the seven stream crossings with mixed riparian growth, and one crossing of the south end of Antelope Creek with valley-oak-dominated riparian forest, would most likely be permanent, rather than temporary; mature woody riparian vegetation would likely return as weedy herbaceous growth after completion of construction. The loss of 4.2 acres of riparian vegetation during road construction would represent a **significant impact** to native plant communities and associated native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Canal, crops/agriculture, ponds, and urban/disturbed land support almost no native flora; the ponds are stock ponds, which are mostly unvegetated, but may in some seasons support small amounts of water-dependent vegetation. However, field observations indicate that most of this is also non-native (e.g., dock, cocklebur, and similar species). Construction impacts to these vegetation types would represent a **less-than-significant impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

CNPS List 1B and State- or Federally Listed Species

Ground disturbance along the road relocation disturbance area during Project construction would result in no direct impact to any known occurrences of special-status species that are State or federally listed or on CNPS List 1B. However, the road relocation disturbance area traverses through potential habitat for the federally endangered *Sidalcea keckii* (SIKE), which was added to survey search lists after Project surveys were conducted, and may, therefore, be present in areas surveyed before 2010. Potential habitat is associated with all road segments except for the Eastside Road (property north of Golden Gate Dam to North Road segment).The road segments with the highest probability of impacting SIKE would be those on the west side of the reservoir footprint in the Peninsula Hills Recreation Area vicinity; SIKE could also be present in other segments of the road construction disturbance area. If occurrences of this rare species are found within the road relocation disturbance area, any direct loss resulting from Project construction would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Known occurrences of CNPS List 1B special-status species were avoided when designing the location of the road relocation route based upon estimates of land required for cut-and-fill and the road surface. However, when the route was expanded to a 200-foot-wide construction disturbance area, parts of two occurrences of *Amsinckia lunaris* (AMLU), a CNPS List 1B species, were included within the road relocation segments to the west and south of the Peninsula Hills Recreation Area. In addition, one occurrence of *California macrophylla* (CAMA), also a CNPS List 1B species, is located immediately adjacent to the expanded construction disturbance area of the road relocation west of the Peninsula Hills Recreation Area. Any loss in either AMLU occurrence or the CAMA occurrence during road construction would represent a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Other than the overlap with AMLU, as long as all construction-related ground disturbance occurs within the 200-foot construction disturbance area, there should be **no impact** of construction-related direct loss or direct disturbance to known occurrences of CNPS List 1B species, when compared to Existing Conditions and the No Project/No Action Alternative.

CNPS List 4 Species

Known occurrences of CNPS List 4 special-status species were avoided when designing the location of the road relocation route except for the Eastside Road/Road 69 connector, which was added after initial (1998 to 2001) Project surveys were completed. Also, when the road construction disturbance area was expanded to include a 200-foot buffer, portions of several occurrences of CNPS List 4 species were included in the construction disturbance area to the west of the Peninsula Hills Recreation Area. Potentially affected are 1 site of *Androsace elongata* ssp. *acuta* (ANELA) and two sites of *Heseperevax caulescens* (HECA). Their direct loss during road construction would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

For all segments of the road relocation construction disturbance area except within the Eastside Road corridor and the Peninsula Hills roads, habitats for some of the CNPS List 4 species exist, but no occurrences of these species were found within the construction disturbance area during Project surveys. Therefore, **no impact** of direct loss is expected to these species from road construction activities, when compared to Existing Conditions and the No Project/No Action Alternative, with the exception of the two segments named.

For the Eastside Road (property north of Golden Gate Dam to North Road segment), abundant occurrences of CNPS List 4 species were found within the construction disturbance area during 2010 surveys. This corridor lies within grassy hills of mostly clay soils, which retain moisture in the spring. These vernally moist grasslands are the preferred habitat for the three species found in abundance within this corridor: 48 sites of *Hesperevax caulescens* (HECA), totaling 13 acres; 43 sites of *Navarretia nigelliformis* (NANI), totaling 13.8 acres; and two sites of *Navarretia heterandra*, totaling 0.14 acre. The occurrences of HECA and NANI are mostly intermingled, so total acreage of special-status plants within this corridor would be closer to 15 acres rather than the sum of all their acreages. At least two patches of native bunch-grasses, *Stipa pulchra*, also occur within this corridor. Although permanent losses would occur within 30 percent of the Project construction disturbance area, even temporary ground disturbance during the construction period would likely result in long-term to permanent losses to these plants. Although some of the HECA and NANI may return, the land is most likely to revegetate with non-native weedy species common in the surrounding grasslands. Therefore, total loss during road construction would be expected; this magnitude of loss would represent a **potentially significant impact** to these three CNPS List 4 species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance along the road relocation corridor during Project construction would result in many small edges and areas of bare soil. These disturbed areas would likely revegetate with mostly non-native annual plant species, with high potential for spread or new colonization in the surrounding foothills and valley by common noxious weeds, such as yellow star-thistle, Italian plume-thistle, barbed goat-grass, mustards and milk thistle. Spontaneous revegetation by native species in disturbed ground is very unlikely, due to the rapid growth rates and other superior competitive abilities of many invasive weedy species. Therefore, even temporary disturbance of up to 950 acres of land while constructing the road relocations, as well as the potential ground disturbance associated with vehicles driving on the shoulder during operation and road maintenance, would increase the probability of spread of noxious weeds. These weed populations would not only displace native vegetation, but would then become a potential seed source for further invasion of surrounding grasslands and foothill environments, affecting the remaining native vegetation, including potentially present special-status plant species. Some adverse effects to occurrences of special-status plant species in adjacent lands could occur due to competition and habitat alteration. The known occurrences which could be affected include those of *Amsinckia lunaris*, *California macrophylla*, and *Hesperevax caulescens* (HECA) in the hills within one mile of the Peninsula Hills Recreation Area. Other as yet undiscovered occurrences of these species, and possibly *Lotus rubriflorus* or *Sidalcea keckii*, could also be affected if they exist in lands surrounding Antelope Valley. Other special-status species potentially affected by weed infestations from road construction include *Navarretia heterandra* (NAHE) in the area southeast of the Lurline Headwaters Recreation Area, and *Navarretia nigelliformis*, NAHE and HECA along the Eastside Road connecting Road 69 with the dam facilities road system near Funks Reservoir. The high potential for new weed infestation and spread from the road relocation construction to these special-status occurrences and their remaining habitats would be a **significant impact** to native vegetation and plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

As a result of Project-related construction, operation, and maintenance activities, or potential lack of fence maintenance, indirect impacts from increased human use and vehicle traffic would also affect some portion of these grasslands, woodlands, shrublands, and riparian creek crossings, including habitat areas for adjacent or nearby special-status plant species. Potential indirect impacts include introduction of noxious weeds, death of shrubs or trees or the decline of native species from disruption of water sources or drainage patterns, disturbance or destruction of bulbs and roots, disturbance of plants, and degradation of soil by off-road vehicle compaction. These indirect impacts would be minimized where the road is fenced on both sides; however, the indirect effects along any portions of the route where fencing is not maintained would represent a **potentially significant impact** on native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

The construction of the Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard would require ground-disturbing activities that would result in the direct and permanent loss of grassland and riparian plant communities. The acreage of land cover lost to Project construction of these facilities represents the actual footprint of the facilities, and would result in complete loss of existing ground cover (Table 13-16).

Table 13-16
Permanent Vegetation Loss Due to Construction of the Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard: Alternative A

Habitat	Permanent Loss (Acres)
Annual grassland	81.6
Pond	0.2
Urban/disturbed	4.3
Valley foothill riparian	3.1
TOTAL	**89.2**

Additional acreage of temporary disturbance (to occur only during the construction period) would be required; assuming an additional requirement of 10 percent of footprint acreage, the construction disturbance area would be approximately nine acres. The majority of land occupied by the construction disturbance area would be adjacent grassland.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

Annual grassland within the footprint of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard has the same value to native plant communities and native plants as described in the impact assessment for Sites Reservoir and Dams; this grassland area has a very low botanical value because it is very disturbed and consists almost totally of non-native weedy grasses and invasive species. This grassland is not a wetland or vernal pool landscape, and supports no special-status plant species. The permanent loss of 81.6 acres and the potential temporary disturbance of an additional nine acres of annual grassland resulting from the construction of these facilities would be a **less-than-significant impact** to native plants communities in the Project vicinity, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Vegetation

Riparian vegetation within the footprint of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard has the same value to native plant communities and native plants as described in the impact assessment for Sites Reservoir and Dams. Construction of these facilities would permanently displace riparian vegetation within approximately 0.2 mile of Funks Creek's natural channel upstream of Funks Dam, in two sites (Figure 13-3), when compared to Existing Conditions and the No Project/No Action Alternative.

One of the two sites consists of the flooded area of the creek channel upstream of Funks Reservoir, and supports almost no riparian vegetation. The second site of spotty interrupted riparian vegetation consists of a thin ribbon of very few riparian trees (cottonwood, willow) and small patches of introduced trees such as walnut, fig, or tree-of-heaven, separated by stretches having little or no vegetation. Weedy non-native herbaceous vegetation is also common along this stretch of Funks Creek, parts of which are very disturbed by cattle crossings. This site supports no special-status plant species. Disturbance of these 3 acres of riparian land (most of which is open water) during construction of these facilities would represent a **less-than-significant impact** to native plant communities due to the degraded nature of the existing riparian community at this site, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Ponds and urban/disturbed land support almost no native flora; the ponds are stock ponds, which are mostly unvegetated, but may in some seasons support small amounts of water-dependent vegetation. However, field observations indicate that most of this is also non-native (e.g., dock, cocklebur, and similar species). Permanent loss of these ponds and urbanized areas during construction of these facilities would represent a **less-than-significant impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

Construction of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard would result in **no impact**, direct or indirect, to any known occurrences of special-status species that are State or federally listed or on any CNPS lists, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, no special-status plant species were found during Project surveys of the footprint areas for these facilities.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance due to construction activities within the footprints for the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard and construction disturbance area would result in many areas of bare soil. These disturbed areas would likely revegetate with mostly non-native annual plant species, with high potential for spread or new colonization in the surrounding foothills and valley by common noxious weeds, such as yellow star-thistle, Italian plume-thistle, barbed goat-grass, mustards and milk thistle. Spontaneous revegetation by native species in disturbed ground is highly unlikely due to the abundance of non-native species in surrounding land. Therefore, even temporary disturbance of up to 90 acres of land while constructing the facilities would increase the probability of spread of noxious weeds. These weed populations would not only displace the little remaining native vegetation in the area, but would then become a potential seed source for further invasion of surrounding grasslands and foothill environments and affect the remaining native vegetation, which would represent a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of these facilities would not be expected to result in additional ground disturbance, and would, therefore, have a **less-than-significant impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Grasslands adjacent to the footprints for the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard may be directly or indirectly affected by Project-related human activities, such as increased road traffic, dust, possible introduction of non-native plant species, or other disturbance during construction, operation, and maintenance. However, due to the already highly disturbed nature of these footprint areas and the absence of any special-status plant species, increased human activity around these facilities would have a **less-than-significant impact** on native plants, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Construction of Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would result in the direct and permanent loss of native and non-native plant communities (Table 13-17). This group of facilities within the Complex includes the Holthouse Reservoir and Dam, the breached Funks Dam, as well as the associated Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, and the Funks Bypass Pipeline, and the Holthouse to T-C Canal Pipeline. Except for the 24-acre T-C Canal discharge pipeline construction disturbance area, the acreage lost represents the direct impact area; i.e., only the footprint of the facilities. Construction of the Holthouse to T-C Canal Pipeline would result in the temporary disturbance of non-native vegetation (Table 13-17). Areas disturbed only during Project construction would be allowed to return to their original vegetation cover following completion of construction.

Table 13-17
Permanent Vegetation Loss and Temporary Disturbance Due to the Construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard: Alternative A

Habitat	Temporary Disturbance* (Acres)	Permanent Loss (Acres)
Annual grassland	9.7	112.7
Alkaline wetland	0	0.5
Canal [existing T-C Canal]	0.4	7.3
Crops/agriculture	14.2	212.3
Urban/disturbed [existing Funks Dam]	0	0.6
Valley foothill riparian	0	7.0
TOTAL	**24.3**	**340.4**

*Acreage represents temporary disturbance associated with the defined construction disturbance area of the Holthouse to T-C Canal Pipeline.

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these facilities. The construction disturbance areas for the Delevan Transmission Line and the Delevan and TRR pipelines would be located immediately adjacent to the footprint of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard facilities. The construction disturbance area for these facilities would be approximately 36 acres in size, but could overlap with the pipeline construction disturbance area. Areas of temporary disturbance would be restored to their original land cover type following completion of Project construction. The majority of vegetation affected by these facilities would be agricultural fields, with some annual grassland.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

Annual grassland within the footprint of each of the Holthouse Reservoir facilities has similar value to native plant communities and native plants as described in the impact assessment for Sites Dam and Reservoir facilities; most of this grassland area has a very low botanical value because it is very disturbed and consists almost totally of non-native weedy grasses and forbs, and is not a wetland or vernal pool landscape. However, there is an area of unknown acreage of grassland within the T-C Canal discharge pipeline construction disturbance area, and possibly extending into parts of the Holthouse Dam footprint, that supports the headwaters of an alkaline wetland swale that extends to the southeast (Figure 13-4). Permanent loss or disturbance of this acreage could disrupt the water supply to the swale. Therefore, direct loss of this portion of the Holthouse Reservoir Complex grassland during construction would be a **potentially significant impact** to native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Vegetation

Riparian vegetation within the footprint of the Holthouse Reservoir facilities consists of approximately seven acres along Funks Creek downstream of Funks Dam. Much of this strip is narrow, but at least two acres immediately downstream of the dam outlet supports a patch of mature and diverse multi-storied riparian vegetation. The remainder is also dotted with mature woody growth, mostly of fairly tall trees and some shrubs and minor amounts of herbaceous understory. Permanent loss of these seven acres of riparian vegetation during construction would be a **significant impact** to native plant communities and native plant species in the area, when compared to Existing Conditions and the No Project/No Action Alternative.

Alkaline Wetland

Direct and permanent loss of up to 0.5 acre of saline/alkaline wetland swale within the grasslands affected by construction of the Holthouse Reservoir facilities would be a loss of a sensitive plant community. The Holthouse Reservoir Complex could block or otherwise disrupt the water supply (whether overland or underground or both) to this alkaline wetland swale. It is also a sensitive and rare native vegetation community (CNPS, 2011) and feeds into a larger saline/alkaline marsh to the southeast. The direct and permanent loss of up to 0.5 acre of saline/alkaline wetland swale within the grasslands affected by construction of Holthouse Reservoir Complex would be a **significant impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Once Holthouse Reservoir is filled, the weight of the water behind the dam would likely change the level and probably the chemistry of the groundwater in the adjacent lands to the south and east (refer to Chapter 10 Groundwater Resources). Because the water in Holthouse Reservoir would be fresh water originating from the Sacramento River, leakage of this water into the groundwater to the east would likely raise the water table with much less saline water than has existed in the past. This change would be likely, over time, to convert the alkaline wetland, vernal pools, flats and swales into a freshwater marsh plant community. Such conversion from rare alkaline meadow/wetland to freshwater seasonal wetland would most likely cause disappearance of most of the saltgrass and other plant species of the current plant community; moisture-loving non-native species already occurring in adjacent weedy fields and ditches would likely invade the area. This probable conversion away from alkaline wetland due to groundwater pressure from Holthouse reservoir would be a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Canal, crops/agriculture, and urban/disturbed land support almost no native flora. Construction impacts to these vegetation types would represent a **less-than-significant impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

Construction of the Holthouse Reservoir facilities would result in **no impact** (no direct loss) to any known occurrences of special-status species that are State or federally listed or on any CNPS lists, when compared to Existing Conditions and the No Project/No Action Alternative. No special-status plant species were found during field surveys in the Holthouse Reservoir Complex footprint area.

However, after inundation the weight of the water behind Holthouse Dam would have a high potential to leak fresh water into adjacent groundwater tables to the east, converting the existing alkaline wetlands, flats, swales, and vernal pools to a freshwater marsh plant community, with moisture-loving weed infestations also likely. Such conversion from rare alkaline meadow/wetland to freshwater seasonal wetland would most likely cause disappearance of all of the special-status plant species that now occur around the saltgrass-dominated plant community and alkaline wetland swales. These species include *Atriplex depressa* (brittlescale – CNPS List 1B) and *Centromadia parryi* ssp. *rudis* (Parry's rough tarplant – CNPS List 4). Other special-status species known from nearby and likely to occur in this area, but suppressed by non-native vegetation growth, include *Atriplex joaquiniana* (San Joaquin spearscale – CNPS List 1B) and *Centromadia parryi* ssp. *parryi* (pappose tarplant – CNPS List 1B). This eventual conversion from alkaline wetland and loss of special-status plant species due to groundwater pressure from Holthouse Reservoir would be a **potentially significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance due to construction activities within the Holthouse Reservoir facilities footprints and T-C Canal pipeline construction disturbance area would result in many areas of bare soil. The Holthouse Dam and Reservoir would have the potential to contribute to weedy growth because the dam would be an earthen structure. In addition, the 24-acre pipeline construction disturbance area would remain with an exposed disturbed surface. This strip would typically revegetate with mostly non-native annual plant species, with high potential for spread or new colonization in the surrounding foothills and valley by common noxious weeds, such as yellow star-thistle, Italian plume-thistle, barbed goat-grass, mustards, and milk thistle. Spontaneous revegetation by native species in disturbed ground is highly unlikely due to the abundance of non-native species in surrounding land. Therefore, even temporary disturbance of up to 24 acres of land while constructing the pipeline would increase the probability of spread of noxious weeds. Operation of these facilities would not be expected to result in additional ground disturbance, but maintenance of the earthen dam and associated roads could result in ground disturbance and therefore also increase the probability of spread of noxious weeds. These weed populations would not only displace the little remaining native vegetation in the area, but would then become a potential seed source for further invasion of surrounding grasslands and adjacent sensitive wetland swales and affect the remaining native vegetation, which would represent a **potentially significant impact** to native plant communities and species, including special-status species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Grasslands adjacent to the Holthouse Reservoir facilities may be directly or indirectly affected by Project-related human activities such as increased road traffic, dust, possible introduction of non-native plant species, or other disturbance such as foot traffic during construction, operation, and maintenance. Due to the already highly disturbed nature of most of the footprint area, this activity would not have much impact. However, due to the proximity of sensitive wetland swales and the presence within them of special-status plant species, increased human activity around these facilities would have a **potentially significant impact** on native plants, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Modifications to the GCID Canal would result in the temporary disturbance of the existing facilities and existing water surface, and could affect adjacent urban/disturbed areas (Table 13-18).

Table 13-18
Temporary Disturbance of Vegetation Communities Due to Modifications of the Glenn-Colusa Irrigation District Canal Facilities: Alternative A

Vegetation Type	Temporary Disturbance (Acres)
Canal (existing GCID Canal)	3.1
Urban/disturbed	1.6
TOTAL	**4.7**

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Other Land Cover Types

Canals and urban/disturbed land support almost no native flora. Construction impacts to these vegetation types would represent a **less-than-significant impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative. However, if any material is sidecast onto toe drain areas, some vernally wet areas could be adversely affected and wetland-related or vernal pool-related vegetation could be affected. For more detail on these and other wetland-related vegetation impacts, refer to Chapter 15 Wetlands and Other Waters of the U.S.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

If any material is sidecast onto toe drain areas, some vernally wet areas could be adversely affected and special-status plant species which potentially occur in those habitats (e.g., *Atriplex joaquiniana* or *A. depressa*, CNPS List 1B species) could be affected.

However, because ground disturbance is expected to occur within the footprint of the existing canal at this Project facility location, it is expected that there would be **no impact** on special-status plant species during construction, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because ground disturbance is expected to occur within the footprint of the existing canal, there would be no expected increase in invasion or spread of noxious weed species during construction, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Because the GCID facilities are existing facilities and operation and maintenance of the facilities with the Project are expected to be similar to what currently occurs, **no impact** on native plant communities or species from human disturbance would occur, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Construction of the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and GCID Canal Connection to the TRR facilities would require ground-disturbing activities that would result in the direct and permanent loss of ground cover (Table 13-19). Construction of the TRR to Funks Creek Pipeline would result in temporary disturbance to ground cover (Table 13-19). However, none of the Project construction activities would disturb areas of native vegetation.

Table 13-19
Permanent Vegetation Loss and Temporary Disturbance Due to the Construction of the Terminal Regulating Reservoir Facilities: Alternative A

Vegetation Type	Temporary Disturbance* (Acres)	Permanent Loss (Acres)
Canal (existing GCID Canal)	0.0	0.9
Crops/agric.	13.6	194.0
Urban/disturbed	0.8	0.0
TOTAL	**14.4**	**194.9**

*Acreage represents temporary disturbance associated with the defined construction disturbance area of the TRR to Funks Creek Pipeline.

Additional temporary ground disturbance would occur as a result of a construction disturbance area for these facilities. Two sides of the reservoir are surrounded by the construction disturbance area for the Delevan and TRR pipelines, which overlap with the footprint of the reservoir. The construction disturbance area acreage would be approximately 19 acres in size, but could overlap with the adjacent pipeline construction disturbance area. Disturbed areas would be restored to their original habitat type following completion of construction.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans,

Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Other Land Cover Types

Because the ground that would be disturbed for the TRR-related facilities is in urban, canal, or agricultural land uses that do not support native plant communities or species, construction of the TRR facilities would have **no impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

Because the ground that would be disturbed for the TRR-related facilities is in urban, canal or agricultural land uses, construction of the TRR facilities would have **no impact** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Because the TRR facilities would be surrounded on all sides by developed land, their construction, operation, and maintenance would have **no impact** on spread of noxious weeds, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Because the TRR facilities would be surrounded on all sides by developed land, their construction, operation, and maintenance would have **no impact** of the disturbance of native plants or their habitats by an increase in human activities at this location, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-**5 discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

The Delevan Pipeline would connect the proposed Delevan Pipeline Intake Facilities to the Holthouse Reservoir Complex. The TRR Pipeline would be aligned parallel to the Delevan Pipeline, and would be completely within the construction disturbance area of the Delevan Pipeline. The TRR Pipeline Road would be located atop the length of the TRR Pipeline, and the Delevan Pipeline Electrical Switchyard would be located where the Delevan Pipeline would cross the existing PG&E transmission line. The construction of the pipelines would require ground-disturbing activities that would result in temporary disturbance; the construction of the TRR Pipeline Road and Delevan Pipeline Electrical Switchyard would require ground-disturbing activities that would result in permanent loss, of mostly agricultural lands (Table 13-20). Areas of temporary disturbance would be restored to their original cover after construction is completed. Temporary disturbance of the alkaline wetland vegetation type would result in long-term conversion to other plant communities or permanent loss because wetland vegetation is unlikely to return to its original state after major mechanical disturbance and disruption of its water regime.

Table 13-20
Permanent Vegetation Loss and Temporary Disturbance Due to the Construction of the Delevan and Terminal Regulating Reservoir Pipelines, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard: Alternative A

Vegetation Type	Temporary Disturbance (Acres)	Permanent Loss (Acres)
Alkaline wetland	14.0	0.0
Canal	8.2	0.1
Crops/agriculture	2,225.6	8.2
Ponds	5.1	0.0
Urban/disturbed	36.8	0.0
Freshwater emergent marsh	4.5	0.0
TOTAL	**2,294.2**	**8.3**

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Alkaline Wetland

Temporary disturbance from constructing the Delevan Pipeline to the 14-acre parcel of disturbed alkaline wetland located approximately three miles west of the Sacramento River and adjacent to the Delevan NWR could affect native plant communities and native plant species. Saline or alkaline wetland meadows represent a disappearing sensitive native plant community. However, a 2011 field survey indicated that this parcel has been altered, and the water regime and vegetation have been managed as an artificial freshwater seasonal wetland. Disturbance of this parcel during Delevan Pipeline construction would be a **less-than-significant impact** to native plant communities and native plant species if the parcel is still highly manipulated at the time of Project construction, when compared to Existing Conditions and the No Project/No Action Alternative.

Freshwater Emergent Marsh

A narrow strip of moisture-dependent vegetation, with some woody species, has colonized the roadside depression and irrigation ditch adjacent to the Delevan NWR on the southern edge of the Delevan Pipeline construction disturbance area (Figure 13-5). Although this strip is located outside of the NWR, this emergent vegetation likely consists of many of the wetland species present in the NWR (tules, cattails, rushes, sedges, small willows). Temporary disturbance of these 4.5 acres of freshwater emergent marsh during Delevan Pipeline construction would likely result in the long-term absence or permanent loss of this vegetation and would represent a **potentially significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Land Cover Types

Other vegetation or land types that would be temporarily displaced from construction of the Delevan and TRR pipelines, and permanently disturbed by construction of the TRR Pipeline Road and Delevan Pipeline Electrical Switchyard, would include agricultural fields, urban/disturbed land, and stock ponds or irrigation ditches (refer to Figure 13-5 for the location of the five-acre agricultural pond). All of these vegetation or land cover categories support almost no native flora. The exception may be the edges of some of the canals that may support native wetland-type vegetation. Almost all of the canal loss would be temporary because the agricultural land uses could be reestablished after construction is complete, resulting in a **less-than-significant impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

No special-status plant species are known or expected to occur within the entirely agricultural areas within the footprint or construction disturbance area of these facilities, with the exception of the vicinity of the 14-acre alkaline wetland parcel mentioned previously along the Delevan Pipeline route. Construction of these facilities and most of the Delevan Pipeline would result in **no impact** to known occurrences of special-status species that are State or federally listed or on any CNPS lists, when compared to Existing Conditions and the No Project/No Action Alternative.

Around the vicinity of the 14-acre alkaline wetland parcel, some possibility exists for presence of special-status plant species associated with a saline/alkaline wetland or meadow habitat, which are currently known to occur less than two miles to the south in the Delevan NWR. These species include *Cordylanthus palmatus* and *Atriplex depressa*. Other special-status plant species known from the Sacramento NWR approximately six miles to the northwest include *Astragalus tener* var. *ferrisiae*, *Atriplex cordulata*, *A. joaquiniana, A. persistens, Chamaesyce hooveri, Hibiscus lasiocarpos* var. *occidentalis, Lepidium latipes* var. *heckardii, Neostapfia colusana, Orcuttia pilosa*, and *Tuctoria greenei* (DFG, 2010a). Also known from this vicinity are both subspecies of *Centromadia parryi*. Potential disturbance or loss of any of these species due to construction within the Delevan Pipeline construction disturbance area would be a **potentially significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative. Field surveys conducted in late summer 2011 indicate no presence of any of the above species or their suitable habitat within the highly manipulated wetland in this parcel, which is being managed as a duck hunting club. However, the presence of *Centromadia parryi* ssp. *rudis* around berms, road edges, and other disturbed sites indicates that a degree of vestigial saline wetland habitat remains, at least for species adapted to disturbance. Therefore, construction of the Delevan Pipeline through the area around this parcel would have a **potentially significant impact** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance due to construction activities within the construction disturbance area of these facilities would result in many areas of newly exposed bare soil. This strip would typically revegetate with mostly non-native annual plant species, with high potential for spread or new colonization in the surrounding valley by common noxious weeds, such as yellow star-thistle, Italian plume-thistle, mustards, milk thistle, sow-thistle, and many other invasive species. Spontaneous revegetation by native species in the disturbed ground is highly unlikely due to abundance of non-native species in surrounding land. Therefore, even temporary disturbance of more than 2,000 acres of land while constructing these facilities would increase the probability of spread of noxious weeds. Operation of these facilities would not be expected to result in additional ground disturbance, but ground disturbance would occur during maintenance of the gravel road and could increase the probability of spread of noxious weeds. Spread of these weed populations would introduce more weeds into surrounding agricultural areas, and would also become a potential seed source for further invasion of adjacent sensitive wetlands of the Delevan NWR, a **potentially significant impact** to native plant communities and species, including special-status species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Throughout most of its length, the Delevan and TRR pipeline construction disturbance area is surrounded on all sides by agricultural and other developed land. The TRR Pipeline Road and Delevan Pipeline Electrical Switchyard are also surrounded by agricultural land. Because no native vegetation communities occur adjacent to the construction disturbance area, an increase in human activity associated with construction, operation, and maintenance would be expected to have **no impact** on native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

The exception to this is in the vicinity of the Delevan NWR, where an increase in vehicle use, foot traffic, possible siltation from erosional damage, litter, dust, and other disturbances associated with Delevan Pipeline construction could temporarily disturb native plant communities and special-status plant species in the NWR. Although restricted to the Project construction period, these indirect effects could degrade the NWR habitat, and represent a **potentially significant impact** to the NWR's native plant communities and species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Transmission Line

The Delevan Transmission Line would parallel, and be located completely within, the construction disturbance area of the Delevan Pipeline, with the exception of the westernmost approximately four miles. Because the impacts of the eastern approximately nine miles of the transmission line construction disturbance area are already accounted for in the impact assessment for the Delevan Pipeline, only the temporary ground disturbance of the remaining four miles of the transmission line are discussed in this section. Disturbed habitats would be restored to their original habitat type following the completion of construction. The construction disturbance area of the Delevan Transmission Line would result in the temporary disturbance of several vegetation communities (Table 13-21).

Table 13-21
Temporary Disturbance of Vegetation Due to the Construction of the Delevan Transmission Line: Alternative A

Vegetation Type	Number of Acres Affected for the Entire Length of the Transmission Line	Number of Acres Affected for the Section of the Transmission Line outside of the Delevan Pipeline Construction Disturbance Area
Annual grassland	69.5	69.5
Alkaline wetland	2.1	0.0
Canal	1.5	1.2
Crops/agriculture	203.7	2.0
Pond	1.04	0.0
Urban/disturbed	1.1	0.0
Valley foothill riparian	1.1	1.1
TOTAL	**280.0**	**73.8**

Although the transmission line would be an above-ground feature and have no associated permanent ground-disturbance, the footings of the transmission towers would result in the permanent loss of vegetation or ground cover. Based on a worst-case scenario, the total permanent vegetation loss associated with the footings would be approximately 2.5 acres of a combination of rice and annual grassland vegetation.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland

Annual grassland within the footprint of the Delevan Transmission Line has the same value to special-status plant species habitat as was described in the impact assessment for the proposed Road Relocations. This grassland is almost completely composed of non-native species and supports no wetland vegetation communities. This portion of the transmission line route would traverse some lands that were not included in original Project surveys; the probability of special-status species occurring in these grasslands is low. The temporary disturbance of 69.5 acres and the potential permanent loss of up to 2.5 acres of annual grassland resulting from the construction of the transmission line would represent a **less-than-significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Vegetation

Valley foothill riparian vegetation within the construction disturbance area of the Delevan Transmission Line has the same value to native plant communities as described in the impact assessment for the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard. The small segments of riparian vegetation are located at two crossings of Funks Creek, both of which support moderate to large individual trees. These trees could be relatively easily avoided during construction of the transmission line. However, even temporary disturbance of

1.1 acres of valley foothill riparian vegetation resulting from the construction of the Delevan Transmission Line would be a **significant impact** to the remnant riparian plant community in this area, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Other Land Cover Types

Concrete-lined canal and agricultural land support virtually no native flora. Temporary disturbance or small amounts of permanent loss of canal or agricultural areas during transmission line construction would have **no impact** to native plants or native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

Construction within the Delevan Transmission Line construction disturbance area would result in **no impact** of direct loss to any known occurrences of special-status species that are State or federally listed or on any CNPS lists. No special-status plant species were found during field surveys conducted in most of the areas traversed by the transmission line route.

Because 1.25 miles of the proposed route would be outside of original survey areas, there is a possibility that one or more special-status plant species could be found in the transmission line construction disturbance area. The species most likely occurring in this area is *Hesperevax caulescens* (HECA*)*, a locally common CNPS List 4 species. One occurrence of HECA found during Project surveys is located immediately adjacent to the transmission line construction disturbance area. Temporary disturbance during construction to a possible occurrence of this species would be a **less-than-significant impact**, as would permanent loss of a small portion due to placement of a tower, when compared to Existing Conditions and the No Project/No Action Alternative. Because such localized sites would be easy to avoid, the overall impact to this species would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

However, small seasonal wetlands, depressions, or swales, including some with slightly alkaline soils, are scattered in the annual grasslands in the vicinity of the unsurveyed portion of the proposed Delevan Transmission Line route. Other CNPS List 4 or List 1B plant species may occur in seasonal wetland habitats potentially present in the unsurveyed area. CNPS-listed species potentially present include *Astragalus*, *Navarretia* or *Hemizonia (=Centromadia)* spp. Even temporary disturbance of small patches of seasonal wetland habitat for some CNPS List 1B or 4 species resulting from the construction of the Delevan Transmission Line would be a **potentially significant impact** to special-status plant species in this area, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance due to construction activities within the Delevan Transmission Line construction disturbance area would result in areas of bare soil. However, parts of the 74-acre transmission line construction disturbance area (the portion outside of Delevan Pipeline construction disturbance area) would remain with an exposed disturbed surface. This strip would typically revegetate with mostly non-native annual plant species, with high potential for spread or new colonization in the surrounding foothills and valley by common noxious weeds, such as yellow star-thistle, Italian plume-thistle, barbed goat-grass, mustards and medusahead. Spontaneous revegetation by native species in disturbed ground in this area is highly unlikely due to abundance of non-native species in surrounding land. Therefore, even the temporary disturbance of up to 74 acres of land while constructing the transmission line would increase the probability of spread of noxious weeds. These weed populations could not only displace the little remaining native vegetation in the area, but would then become a potential seed source for further invasion of surrounding grasslands. East of the T-C Canal, the weed infestations could also affect sensitive alkaline wetland swales and known special-status plant occurrences approximately 0.25 mile to the north of the transmission line construction disturbance area, resulting in a **potentially significant impact** to native plant communities and species, including special-status species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Grasslands adjacent to the Delevan Transmission Line construction disturbance area may be directly or indirectly affected by Project-related human activities, such as increased dust, possible introduction of non-native plant species, or other disturbance, such as foot traffic. Due to the already highly disturbed nature of the grassland area, this activity would not have much impact, and the activity would be limited to the construction period. Human activity associated with construction and maintenance is unlikely to extend north by 0.25 mile to the sensitive alkaline swales. The transmission line would be operated remotely, and therefore, would not have human disturbance associated with its operation. Increased human activity during Project construction and maintenance could temporarily disturb the Funks Creek riparian crossings; however, because they are already highly disturbed, this would be a **less-than-significant impact** on native plants and native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Pipeline Intake Facilities

Alternative A includes a fish screen and pumping/generating facility that has a 2,000 cfs diversion capacity and 1,500 cfs release capacity, to be located on the Sacramento River. The construction of the Delevan Pipeline Intake Facilities would require ground-disturbing activities that would result in the direct and permanent loss of native vegetation communities (Table 13-22).

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these facilities. The construction disturbance area for the Delevan Pipeline Intake Facilities would be approximately 1.9 acres in size.The construction disturbance area of the Delevan Pipeline is located immediately adjacent to these facilities and could be used as a staging area. Disturbed areas would be restored to their original habitat type following completion of construction. The vegetation affected by the construction disturbance area proposed for the Intake Facilities would be agricultural (orchards).

Table 13-22
Permanent Vegetation Loss Due to the Construction of the Delevan Pipeline Intake Facilities: Alternative A

Vegetation Type	Permanent Loss (Acres)
Canal	0.6
Crops/agriculture	11.1
Fremont cottonwood riparian	1.1
Open water (Sacramento River)	1.6
Urban/disturbed	4.2
Valley foothill riparian	0.5
TOTAL	**19.1**

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Riparian Scrub

The riparian vegetation that would be permanently lost due to construction of the Delevan Pipeline Intake Facilities includes a 0.5-acre strip of mostly herbaceous growth on the existing levee bank. The herbaceous growth is a dense mixture of native and non-native plant species, mainly Johnson-grass (*Sorghum halepense*), mustards, horseweed (*Conyza* sp), cocklebur (*Xanthium* sp.), *Verbena* species, mugwort (*Artemisia douglasiana*) and occasional willow shrubs. Because this vegetation has colonized the levee slope over the years, it is a product of disturbance, and its loss during construction would be a **less than-significant-impact** to native plant communities and species, when compared to Existing Conditions and the No Project/No Action Alternative.

Fremont Cottonwood Forest

The Fremont cottonwood-dominated riparian forest area that would be permanently lost due to construction of the Delevan Pipeline Intake Facilities is a small remnant of previously more extensive forests along this part of the Sacramento River. It consists of Fremont cottonwoods (*Populus fremontii*) that are more than 60 feet tall and wild grape (*Vitis californica*), with a mid-story of box elder (*Acer negundo*) and tree willows (Red willow, *Salix laevigata*). Occasional large valley oaks grow at the outer edges of this area. The permanent loss of 1.1 acres of this remnant mature and multi-layered riparian forest during construction of the intake facilities would be a **significant impact** to the continuity of the remaining riparian forest along the Sacramento River and to native plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Special-Status Plant Species

No special-status plant species were found during field surveys conducted in the footprint area of these facilities. Construction within the Delevan Pipeline Intake Facilities footprint would result in **no impact** of direct loss to any known occurrences of special-status plant species that are State or federally listed or on any CNPS lists, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Ground disturbance due to construction activities within the Delevan Pipeline Intake Facilities construction disturbance area would result temporarily in areas of bare soil. Most of the exposed area would be quickly covered with facility structures. However, edges would remain as recently disturbed soil. Spontaneous revegetation by a few native species in disturbed ground in this area is possible, due to abundance of both native and non-native species in adjacent riparian vegetation and upstream seed sources via river flows. However, these disturbed edges would tend to revegetate with mostly non-native plant species, with high potential for spread or new colonization along the river and in the edges of adjacent riparian forests by common noxious weeds, such as Johnson-grass, cocklebur, horseweed, telegraph weed, verbenas, and even giant reed (*Arundo donax*). Therefore, even temporary disturbance of up to 19 acres of land while constructing the intake facilities would increase the probability of spread of noxious weeds. These weed populations could not only displace the remaining native vegetation in the area, but would then become a potential seed source for further invasion, especially downstream, and would be a **potentially significant impact** to native plant communities and species, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities would not be expected to result in additional ground disturbance, and therefore, would have a **less-than-significant impact** on the spread of noxious weed species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Riparian forests adjacent to the Delevan Pipeline Intake Facilities construction area may be directly or indirectly affected by Project-related human activities such as increased dust, refuse, fire, pollutants, possible introduction of non-native plant species, or other disturbance such as foot traffic. The increased activity would be limited to the construction period because operation and maintenance would take place entirely within the facility perimeters. Increased human activity during construction would be a **less-than-significant impact** on native plants and native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Project Buffer

Exception for fence construction, demolition of existing structures, and the creation of a fuelbreak, the native plant species and vegetation communities within the Project Buffer would not be subject to construction activities. The acreage of vegetation types included within the Project Buffer, but outside of facility footprints, is presented in Table 13-23.

Table 13-23
Acres of Vegetation Types Within the Project Buffer*: Alternative A

Vegetation Type	Acres within Project Buffer
Annual grassland	8,083.1
Agriculture	403.0
Blue oak woodland	4,180.1
Canal	15.8
Chamise	1.9
Open water	0.1
Ponds	17.2
Urban/disturbed	35.4
Valley foothill riparian	63.4
TOTAL	**12,800.0**

*Calculated by subtracting the acreage of permanent disturbance associated with each proposed Project facility that is surrounded by the Project Buffer, the acreage of existing Funks Reservoir, and the acreage of the portion of the existing GCID Canal that is surrounded by the Project Buffer, from the total acreage of land that would be acquired for the Project.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Annual Grassland, Blue Oak Woodland, Canal, Chamise, Ponds and Valley-Foothill Riparian

The above-listed vegetation or land cover types within the Project Buffer have the same value to native plant communities and species as described for other Project features, and would not be altered or converted to other vegetation or land cover types. Construction activities associated with fence building would have a negligible impact on these vegetation types because the footprint of the fence posts would be small, and a large portion of the Project Buffer is already fenced. However, the potential creation and maintenance of a fuelbreak would require vegetation clearing that, if maintained around the entire perimeter of the buffer, could result in a substantial adverse effect due to the loss of native plant communities and portions of native plant species populations. Therefore, the potential loss of native vegetation associated with construction of the Project Buffer fuelbreak resulting from implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

<u>Agriculture</u>

The agricultural land cover within the Project Buffer has the same value to native plant communities and species as described for other Project features, but would not be maintained as agricultural lands following Project implementation. These agricultural lands would be converted to natural vegetation, most likely to annual grassland. Native plant species would benefit from this conversion, and no native plant species would be adversely affected (because they do not occur in agricultural lands). Therefore, the loss of 211.4 acres of agricultural land cover that would be converted to natural vegetation within the Project Buffer as a result of implementation of Alternative A would be a **beneficial effect** to native plant communities and species, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the Project Buffer consists of roads and structures. Construction activities within the Project Buffer would include the demolition of existing structures; following demolition, the urban/disturbed areas would be converted to natural vegetation, most likely to annual grassland. This habitat conversion would benefit native species, and no native plant species would be adversely affected (because they do not occur in urban or disturbed lands). Demolition of structures within the Project Buffer resulting from implementation of Alternative A would be a **beneficial effect** to native plant communities and species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The only Project-related activities within the Project Buffer that could result in the potential loss of special-status plant species would be the creation and maintenance of a perimeter fuelbreak. Loss of both individuals and habitat of some special-status plant species, in particular *Sidalcea keckii*, *Lotus rubriflorus* or *Amsinckia lunaris*, could occur in these fuelbreak impact areas. The extent of this potential disturbance or loss is unknown because much of the land within the Project Buffer has not been surveyed. However, the grasslands within the buffer provide suitable habitat for these species. Therefore, construction and maintenance of a perimeter fuelbreak within the Project Buffer resulting from implementation of Alternative A would be a **potentially significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

Construction activities associated with fence building would result in areas of ground disturbance around the footprint of the fence posts. The potential creation and maintenance of a fuelbreak would require vegetation clearing that, if maintained around the entire perimeter of the buffer, could result in a substantial amount of ground disturbance. This disturbed ground, if not actively restored to its original condition, could result in the spread of weed species. The demolition of existing structures and their foundations could result in areas of bare ground that, if not actively restored to a pre-determined vegetation community, would have the potential for invasion by weed species. Therefore, the potential invasion or spread of noxious weed species within the Project Buffer resulting from implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance

Although signs would be posted to prevent recreationists from using the Project Buffer lands, it is possible that unauthorized hiking, biking, or other recreational activity would occur within the buffer during Project operation. In addition, the construction crews required to demolish existing structures or build fences would cause a temporary disturbance to vegetation within that area. Therefore, human disturbance associated with Project Buffer activities would have a **potentially significant impact** on native plant species and vegetation communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-5: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local or Regional Habitat Conservation Plan, or

Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Bot-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Summary of Alternative A Impacts to Vegetation Types

Construction, operation, and maintenance of Alternative A would result in the permanent loss of 13,572.6 acres, and the temporary disturbance of an additional 5,357.9 acres, of vegetation (Table 13-24).

Table 13-24
Acres of Vegetation Types Subject to Alternative A Construction Impacts[a]

Vegetation Type	Acreage	
	Permanent Loss[b]	**Temporary Disturbance[c]**
Annual grassland	12,151.8	2,091.4
Alkaline wetland	0.5	14.0
Blue oak woodland	262.0	353.5
Blue oak savanna	225.4	269.8
Blue oak /mixed chaparral	14.0	21.2
Canal	9.1	14.1
Chamise	0.6	1.9
Crops/agriculture	700.0	2,307.7
Fremont cottonwood riparian	1.1	0.0
Fresh emergent wetland	0.0	4.5
Mixed chaparral	0.8	1.8
Pond	20.8	226.4
Open water	1.6	0.0
Urban/disturbed	88.1	46.9
Valley foothill riparian	75.9	4.6
Valley oak riparian	17.5	0.1
Valley oak woodland	3.4	0.0
TOTAL	**13,572.6**	**5,357.9**

[a]Calculated acreage does not include acres associated with the Project Buffer because the location and extent of disturbance is not yet specified.

[b]Total permanent vegetation loss acreage includes the footprint of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Intake Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction of facilities within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.

[c]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and the footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations (minus the acreage of estimated permanent loss), Delevan and TRR pipelines, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modificaitons. Total temporary disturbance acreage also includes the estimated construction disturbance areas (outside of the facility footprints) for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Intake Facilities.

13.3.7 Impacts Associated with Alternative B

13.3.7.1 Extended Study Area – Alternative B

<u>Construction, Operation, and Maintenance Impacts</u>

The impacts associated with Alternative B, as they relate to native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**), would be the same as described for Alternative A for the Extended Study Area.

13.3.7.2 Secondary Study Area – Alternative B

<u>Construction, Operation, and Maintenance Impacts</u>

The impacts associated with Alternative B operations on native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**) would be the same as described for Alternative A for Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex, Trinity River, Klamath River, Spring Creek, Clear Creek, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

For the remaining facilities, the potential effects to native plants from human disturbance (**Impact Bot-4**) and conflicts with conservation plans (**Impact Bot-5**) would also be the same as described for Alternative A.

Operational differences for Alternative B, when compared to Alternative A for Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, the Sacramento River, Sutter Bypass, and Yolo Bypass, are discussed below.

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Operational modeling results for Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, are similar to those described for Alternative A because Alternative B would also result in improved storage conditions. However, Alternative B operations would result in more variable reservoir surface water elevation fluctuations than Alternative A.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Surface water elevation fluctuations associated with implementation of Alternative B would be less severe than those associated with Existing Conditions or the No Project/No Action Alternative. Therefore, changes in operations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake that would result in improved storage and reduced water level fluctuations would have a **beneficial effect** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Bot-1** discussion. Changes in operations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake that would result in improved storage and reduced water level fluctuations would have a **beneficial effect** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

The reduced fluctuations associated with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, would also include a **beneficial effect** of reduced potential for spread of noxious weeds, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento River

Operational modeling indicates that Alternative B Sacramento River flows would experience changes similar to those described for Alternative A. However, operation of Alternative B would result in the diversion of up to 3,900 cfs during winter flows, whereas Alternative A would divert up to 5,900 cfs during winter flows. The reduced rate of diversion associated with Alternative B would require a longer duration of diversion, lasting from February through May.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the valley foothill riparian vegetation alliance along the Sacramento River would increase or remain similar if Alternative B is implemented, relative to the Existing Conditions and the No Project/No Action Alternative. The only exception is that the SacEFT indicates a slight increase in the number of years with post-initiation scour risk for Fremont cottonwood seedlings if Alternative B is implemented, relative to the No Project/No Action Alternative.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Despite the change in the rate and duration of diversion, operational modeling for Alternative B, including modeling that is specific to riparian vegetation, indicates only minimal effects to riparian vegetation resulting from the described changes in the flow regime. Riparian vegetation downstream of the intakes would not be expected to be adversely affected. Therefore, the modifications of the Sacramento River's existing flow regime resulting from operation of Alternative B would have a **less-than-significant impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes in the Sacramento River flow regime would not be expected to adversely affect riparian vegetation, they would also not be expected to affect riparian-associated special-status plant species.

Therefore, the modifications of the Sacramento River's existing flow regime resulting from operation of Alternative B would have a **less-than-significant impact** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

The minimal effects of operation of Alternative B on vegetation, when compared to Existing Conditions and the No Project/No Action Alternative, would result in a **less-than-significant impact** on the spread of noxious weeds.

Sutter Bypass and Yolo Bypass

Alternative B's reduced rate of diversion (3,900 cfs) of flow from the Sacramento River, when compared to Alternative A (5,900 cfs), would require a longer duration of diversion. Alternative B would reduce the velocity and volume of floodwaters entering the Sutter and Yolo bypasses from the Sacramento River by 2,000 cfs, when compared to Alternative A.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The reduction in the velocity and volume of water entering the bypasses could provide the same benefits of reduced scouring to native plant communities as was described for Alternative A. Therefore, the modification of the existing flow regime in both the Sutter and Yolo bypasses that would result in reduced magnitude and velocity of incoming floodwaters would have a **potentially beneficial effect** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because modification of the existing flow regime in the Sutter and Yolo bypasses would potentially benefit native plant communities, they would also be expected to benefit associated special-status plant species that may occur in the bypasses. Therefore, the modification of the existing flow regime in both the Sutter and Yolo bypasses that would result in reduced magnitude and velocity of incoming floodwaters would have a **potentially beneficial effect** on special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-3: An Increase in Potential for the Invasion or Spread of Noxious Weed Species

The reduced flow rates and water volume compared to Existing Conditions and the No Project/No Action Alternative would also include a **potentially beneficial effect** of reduced potential for spread of noxious weeds.

13.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to botanical resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

Although the footprint of the Recreation Areas would be the same for Alternatives A and B, the associated electrical distribution line alignment would differ as a result of the change in location of Golden Gate Dam. With implementation of Alternative B, 2.9 fewer acres of annual grassland would be affected by the Recreation Area Electrical Distribution Line construction disturbance area. However, this difference in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**) as described for Alternative A.

In addition, the road relocations associated with Alternative B differ from those for Alternative A, mostly due to changes to the saddle dam access roads. An additional 2.5 acres of vegetation would be affected by Alternative B roads. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**) as described for Alternative A.

For the remaining facilities, the impact of noxious weed species (**Impact Bot-3**), potential effects to native plants from human disturbance (**Impact Bot-4**), and conflicts with conservation plans (**Impact Bot-5**) would also be the same as described for Alternative A. However, for Alternative B, the footprint and/or construction disturbance area of Sites Reservoir and Dams, the Delevan Transmission Line, and the Delevan Pipeline Discharge Facilities differ from Alternative A. These changes would affect different acreages of vegetation. The differences between these facilities and their impacts on botanical resources are described below.

Sites Reservoir Inundation Area and Sites Reservoir Dams

Alternative B includes the construction of a 1.81-MAF Sites Reservoir, which would require the construction of Sites Dam, Golden Gate Dam, and nine saddle dams. Sites and Golden Gate dams would have a larger footprint, and the Golden Gate Dam location would be shifted for Alternative B, when compared to Alternative A. Construction-related ground-disturbing activities and vegetation removal, and the consequent filling of the reservoir, would result in the direct and permanent loss of the same vegetation communities as described in Alternative A, but more acreage of some communities would be lost with the construction and filling of the larger reservoir (Table 13-25).

Table 13-25
Permanent Vegetation Loss Due to the Construction and Filling of the 1.81-MAF Sites Reservoir and Associated Dams: Alternative B Compared to Alternative A

Vegetation Type	Permanent Loss (Acres) Alternative A	Permanent Loss (Acres) Alternative B	Additional Loss Associated with Alternative B when Compared to Alternative A
Annual grassland	11,654.6	13,196.9	1542.3
Blue oak woodland	182.3	399.0	216.7
Blue oak savanna	163.1	313.2	150.1
Blue oak/mixed chaparral	8.1	27.5	19.4
Cropland	267.9	267.9	0.0
Ponds	20.2	21.8	1.6
Urban/disturbed	76.1	78.8	2.7
Valley foothill riparian	64.1	71.1	7.1
Valley oak riparian	17.4	26.4	9.0
Valley oak woodland	3.4	3.5	0.1
TOTAL	**12,457.2**	**14,406.1**	**1,948.9**

The construction disturbance area for the 1.81-MAF Sites Reservoir would be the same as described for the 1.27-MAF reservoir. The construction disturbance area could disturb as much as 1,000 acres of land, with the majority of disturbed habitat consisting of annual grassland vegetation.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

Substantially larger areas of the most botanically diverse vegetation communities would be lost with implementation of Alternative B, when compared to Alternative A, because the additional acreage lost would be within the blue oak associations and at the blue oak woodland-annual grassland edges around the perimeter of Antelope Valley. This permanent vegetation loss, as well as the temporary disturbance of the construction disturbance area, resulting from the construction and filling of Sites Reservoir and Dams would be a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The additional acreage lost with implementation of Alternative B, when compared to Alternative A, is likely to support several different special-status plant species, including the federally endangered *Sidalcea keckii*. Construction of the larger reservoir with implementation of Alternative B would also result in the loss of one known occurrence of the rare *Lotus rubriflorus*, which lies outside of the inundation area for the 1.27-MAF reservoir footprint of Alternative A. In addition to this CNPS List 1B species, five occurrences of three CNPS List 4 species would be lost to construction of the larger Alternative B reservoir, in addition to those lost with implementation of Alternative A: two occurrences of *Androsace elongata* var. *acuta*, two of *Hesperevax caulescens*, and two of *Navarretia heterandra*. The direct impacts to special-status plant species, as well as the temporary impacts within the construction disturbance area, resulting from the construction and filling of Sites Reservoir and Dams would be a **significant impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

The Alternative B design of the Delevan Transmission Line differs from that of Alternative A. Because there would be no pumping/generating plant associated with Delevan Pipeline Discharge Facility, there would be no transmission line alignment from the Sacramento River westward to the existing WAPA or PG&E transmission line. There would, however, still be a transmission line alignment from approximately three miles east of the Sites Electrical Switchyard to the existing WAPA or PG&E transmission line. The construction disturbance area of the Alternative B Delevan Transmission Line would result in the temporary disturbance and small amounts of permanent loss of vegetation, but at a much smaller scale than with Alternative A (Table 13-26).

Table 13-26
Temporary Disturbance of Vegetation Due to the Construction of the Delevan Transmission Line: Alternative B Compared to Alternative A

Vegetation Type	Temporary Disturbance (acres) for the Entire Length of the Delevan Transmission Line: Alternative A	Temporary Disturbance (acres) for the 4-mile Section of the Delevan Transmission Line outside of the Construction Disturbance Area of the Delevan Pipeline: Alternative A	Temporary Disturbance (acres) for the Entire Length of the Delevan Transmission Line*: Alternative B
Annual grassland	69.5	69.5	54.6
Alkaline wetland	2.1	0.0	0.0
Canal	1.5	1.2	0.6
Cropland	203.7	2.0	0.0
Pond	1.04	0.0	0.0
Urban/disturbed	1.1	0.0	0.0
Valley foothill riparian	1.1	1.1	1.1
TOTAL	**280.0**	**73.8**	**56.3**

*Length of the Alternative B Delevan Transmission Line calculated from the start of the line (approximately three miles east of the Sites Electrical Switchyard) to the existing PG&E transmission line. Number of affected acres would be slightly reduced if the Project connects to the existing WAPA transmission line.

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The footings of the transmission towers would result in the permanent loss of vegetation. Based on a worst-case scenario, the total permanent vegetation loss associated with the transmission line tower footings would be approximately 0.5 acre of annual grassland vegetation, which is less than the 2.5-acre loss associated with the implementation of Alternative A. Despite the reduced amount of permanent vegetation loss associated with implementation of Alternative B, the permanent loss and temporary disturbance of vegetation communities resulting from construction of the transmission line would be a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The temporary construction disturbance to as-yet unsurveyed occurrences of *Hesperevax caulescens* (HECA) is possible along the central 1.25 miles of this route; this disturbance would represent a **less-than-significant impact** to special-status plant species due to HECA's widespread distribution and tolerance for disturbance, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Discharge Facility

If Alternative B is implemented, the Delevan Pipeline would be operated as a release-only pipeline. The associated Delevan Pipeline Discharge Facility would, therefore, not include a fish screen or any of the facilities needed for pumping and generating operations that are associated with Alternative A. The construction of the Delevan Pipeline Discharge Facility would require ground-disturbing activities that would result in the direct and permanent loss of native vegetation communities (Table 13-27), but at a smaller scale than described for the Intake Facilities associated with Alternative Aover the entire length of the transmission lineacrestservoir 19 acresasement for the Delevan and TRR pipelines. size. Them ma.

Table 13-27
Permanent Vegetation Loss Due to the Construction of the Delevan Pipeline Discharge Facility: Alternative B Compared to the Alternative A Delevan Pipeline Intake Facilities

Vegetation Type	Permanent Loss (Acres) by Alternative A	Permanent Loss (Acres) by Alternative B
Canal	0.6	0.1
Crops/agriculture	11.1	3.9
Fremont cottonwood riparian	1.1	1.5
Open water (Sacramento River)	1.6	0.1
Urban/disturbed	4.2	2.0
Valley foothill riparian	0.5	0.1
TOTAL	**19.1**	**7.7**

Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project

The main native plant community lost to construction of the Delevan Pipeline Discharge Facility would be mature Fremont cottonwood riparian forest. Although the affected length of this plant community bordering the Sacramento River edge would be somewhat less with Alternative B than for the Alternative A Intake Facilities, the total acreage removed would be greater by more than 36 percent, or 0.4 acre. This permanent loss of vegetation communities resulting from construction of the discharge facility would be a **significant impact** to native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these facilities. The construction disturbance area for the Delevan Pipeline is located immediately adjacent to these facilities and could potentially be used as a staging area. The construction disturbance area acreage for the Delevan Pipeline Discharge Facility would be approximately 0.8 acre in size. Disturbed areas would be restored to their original land cover following completion of construction. The land cover that would be affected by this construction disturbance area would be agricultural (orchards). Orchards support almost no native flora, and areas of disturbance would be reestablished after construction is complete, resulting in a **less-than-significant impact** on native plant communities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No special-status plant species were found during field surveys conducted in the footprint of these facilities. Therefore, construction within the Delevan Pipeline Discharge Facility footprint would result in **no impact** to special-status plant species, when compared to Existing Conditions and the No Project/No Action Alternative.

Summary of Alternative B Impacts to Vegetation Types

Construction, operation, and maintenance of Alternative B would result in the permanent loss of 15,508.3 acres, and the temporary disturbance of an additional 5,341.4 acres, of vegetation (Table 13-28).

Table 13-28
Acres of Vegetation Subject to Alternative B Construction Impacts

Vegetation Types	Acreage	
	Permanent Loss[a]	Temporary Disturbance[b]
Annual grassland	13,694.4	2079.4
Alkaline wetland	0.5	14.0
Blue oak woodland	478.6	353.5
Blue oak savanna	375.5	269.7
Blue oak /mixed chaparral	33.4	21.1
Canal	8.6	13.5
Chamise	0.6	1.9
Crops/agriculture	691.1	2,304.6
Fremont cottonwood riparian	1.4	0.0

Table 13-28
Acres of Vegetation Subject to Alternative B Construction Impacts

Vegetation Types	Acreage	
	Permanent Loss[a]	Temporary Disturbance[b]
Fresh emergent wetland	0.0	4.5
Mixed chaparral	0.8	1.8
Pond	22.4	226.4
Open water	0.1	0.0
Urban/disturbed	88.6	46.9
Valley foothill riparian	82.4	4.0
Valley oak riparian	26.4	0.1
Valley oak woodland	3.5	0.0
TOTAL[c]	**15,508.3**	**5,341.4**

[a]Total permanent vegetation loss acreage includes the footprint of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Discharge Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.

[b]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and the footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations (minus the acreage of estimated permanent loss), Delevan and TRR pipelines, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modifications. Total temporary disturbance acreage also includes the estimated construction disturbance areas (outside of the footprints) for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Modifications, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Discharge Facilities.

[c]Total acreage does not include acreage associated with the Project Buffer.

13.3.8 Impacts Associated with Alternative C

13.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**), would be the same as described for Alternative A for the Extended Study Area.

13.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C operations on native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**) would be the same as described for Alternative A for Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex, Trinity River, Klamath River, Spring Creek, Clear Creek, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

Because Alternative C includes the three Project intake locations that were described for Alternative A, the operational impacts associated with Alternative C, as they relate to native plant communities (**Impact Bot-1**), special-status plant species (**Impact Bot-2**), and noxious weed species (**Impact Bot-3**), as well as the potential effects from human disturbance (**Impact Bot-4**) or conflicts with conservation plans (**Impact Bot-5**), would be the same as described for Alternative A for Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, Sacramento River, Sutter Bypass, and Yolo Bypass.

13.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to botanical resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating PlantTRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Delevan Transmission Line and Delevan Pipeline Intake Facilities included in Alternative C are the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to botanical resources as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Electrical Distribution Lines associated with the Recreation Areas, and Road Relocations and South Bridge are the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to botanical resources as described for Alternative B.

The boundary of the Project Buffer is the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

Summary of Alternative C Impacts to Vegetation Types

Construction, operation, and maintenance of Alternative C would result in the permanent loss of 15,521.7 acres, and the temporary disturbance of an additional 5,257.6 acres, of vegetation (Table 13-29).

Table 13-29
Acres of Vegetation Types Subject to Alternative C Construction Impacts

Vegetation Type	Acreage	
	Permanent Loss[a]	Temporary Disturbance[b]
Annual grassland	13,694.7	2091.5
Alkaline wetland	0.5	14.0
Blue oak woodland	478.6	353.5
Blue oak savanna	375.5	269.7
Blue oak /mixed chaparral	33.4	21.1
Canal	9.1	14.1
Chamise	0.6	2.1
Crops/agriculture	700.0	2,307.7
Fremont cottonwood riparian	1.1	0.0
Fresh emergent wetland	0.0	4.5
Mixed chaparral	0.8	1.8
Pond	22.4	226.6
Open water	1.6	0.0
Urban/disturbed	90.8	46.9
Valley foothill riparian	82.6	4.0
Valley oak riparian	26.5	0.1
Valley oak woodland	3.5	0.0
TOTAL[c]	**15,521.7**	**5,357.6**

[a]Total permanent vegetation loss acreage includes the footprint of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Intake Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.

[b]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations (minus the acreage of estimated permanent loss), Delevan and TRR pipelines, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modifications. Total temporary disturbance acreage also includes the estimated construction disturbance areas (outside of the footprints) for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Intake Facilities.

[c]Total acreage does not include acreage associated with the Project Buffer.

13.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 13-30 for the impacts that have been identified as significant or potentially significant.

Table 13-30
Summary of Mitigation Measures for NODOS Project Impacts to Botanical Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Bot-1: A Substantial Adverse Effect, Including Conversion to Non-Native Vegetation, on any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS, or any Native Plant Community Known to be Rare, Unusual, or Becoming Uncommon in the Biogeographic Region of the Project				
Impact Bot-1a: Loss of Vegetation Community	Sites Reservoir and Dams, Salt Lake wetlands, construction disturbance area outside of the Sites Reservoir footprint; Recreation Areas; Road Relocations; Delevan Transmission Line; Delevan Pipeline; Delevan Pipeline Intake/Discharge Facilities; Project Buffer	Potentially Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
	Holthouse Reservoir Complex	Potentially Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant or Potentially Significant and Unavoidable
Impact Bot-1b: Annual Grassland (of higher botanical value)	Valley edges of Sites Reservoir and Dams, Salt Lake wetlands, staging area outside of Sites Reservoir footprint; Recreation Areas; Road Relocations; Holthouse Reservoir Complex swale area; Project Buffer	Potentially Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
	Holthouse Reservoir Complex	Potentially Significant	Mitigation Measure Bot-1b: Conduct Watershed Hydrological Studies	Less than Significant
Impact Bot-1c: Blue Oak Woodland (includes savanna and woodland with chaparral understory)	Valley edges of Sites Reservoir and Dams, Recreation Areas, Road Relocations; Project Buffer	Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
	Recreation Areas, Road Relocations, Project Buffer	Significant	Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant

Table 13-30
Summary of Mitigation Measures for NODOS Project Impacts to Botanical Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Bot-1d: Riparian Vegetation	Sites Reservoir and Dams, Road Relocations, Holthouse Reservoir Complex, Delevan Transmission Line, Delevan Pipeline Intake/Discharge Facilities; Project Buffer	Potentially Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
	Road Relocations, Delevan Transmission Line, Project Buffer	Potentially Significant	Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant
Impact Bot-1e: Valley Oak Woodland	Sites Reservoir and Dams	Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant
Impact Bot-1f: Alkaline Wetland	Holthouse Reservoir Complex	Potentially Significant	Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS	Less than Significant or Potentially Significant and Unavoidable
			Mitigation Measure Bot-1d: Conduct Groundwater Hydrological Studies	Less than Significant or Potentially Significant and Unavoidable
			Mitigation Measure Bot-1e: Minimize Impacts by Siting Facilities Away from Drainage Swales and Implementing BMPs	Less than Significant or Potentially Significant and Unavoidable
Impact Bot-1g: Freshwater Emergent Marsh	Delevan Pipeline	Potentially Significant	Mitigation Measure Bot-1f: Implement BMPs to Avoid Disturbance of Marsh Vegetation in Adjacent Delevan National Wildlife Refuge	Less than Significant
Impact Bot-2: A Substantial Adverse Effect, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS				
Impact Bot -2a Fed/1B-A: Special-Status Plant Species: CNPS List 1B and State- or Federally Listed Species	Sites Reservoir and Dams	Significant or Potentially Significant	Mitigation Measure Bot-2a: Conduct Pre-Construction Surveys for Sidalcea keckii and Amsinckia lunaris; if Found, Compensate According to USFWS Guidelines	Significant and Unavoidable

Table 13-30
Summary of Mitigation Measures for NODOS Project Impacts to Botanical Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Recreation Areas, Road Relocations; Project Buffer	Significant or Potentially Significant	Mitigation Measure Bot-2a: Conduct Pre-Construction Surveys for Sidalcea keckii and Amsinckia lunaris; if Found, Compensate According to USFWS Guidelines	Less than Significant
	Project Buffer	Significant or Potentially Significant	Mitigation Measure Bot-2b: Avoid occurrences of CNPS List 1B and State- or Federally-Listed Plant Species	Less than Significant
	Delevan Pipeline (managed alkaline wetland parcel)	Potentially Significant	Mitigation Measure Bot-2c: Conduct Pre-Construction Surveys for Rare Alkaline Wetland Species	Less than Significant
	Delevan Transmission Line (unsurveyed grassland portion)	Potentially Significant	Mitigation Measure Bot-2d: Conduct Pre-Construction Surveys for Special-Status Plant Species	Less than Significant
			Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant
Impact Bot-2b List 4-A: Special-Status Plant Species: CNPS List 4 Species	Sites Reservoir and Dams	Potentially Significant	Mitigation Measure Bot-2e: Compensate for Loss or Disturbance of CNPS List 4 Species According to CDFG Guidelines	Less than Significant or Potentially Significant and Unavoidable
	Recreation Areas, Road Relocations	Potentially Significant	Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant
			Mitigation Measure Bot-2e: Compensate for Loss or Disturbance of CNPS List 4 Species According to CDFG Guidelines	
	Delevan Pipeline (former alkaline wetland area)	Potentially Significant	Mitigation Measure Bot-2d: Conduct Pre-Construction Surveys for Special-Status Plant Species	Less than Significant when combined with Mitigation Measure Bot-2e

Table 13-30
Summary of Mitigation Measures for NODOS Project Impacts to Botanical Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
			Mitigation Measure Bot-2e: Compensate for Loss or Disturbance of Special-Status Plant Species According to CDFG Guidelines	
	Delevan Transmission Line (unsurveyed grassland portion)	Potentially Significant	Mitigation Measure Bot-2d: Conduct Pre-Construction Surveys for Special-Status Plant Species	Less than Significant when combined with Mitigation Measures Bot-2e and Bot-1c
			Mitigation Measure Bot-2e: Compensate for Loss or Disturbance of Special-Status Plant Species According to CDFG Guidelines	Less than Significant when combined with Mitigation Measures Bot-2d and Bot-1c
			Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant when combined with Mitigation Measures Bot-2d and Bot-2e
Impact Bot-2c: Special-Status Plant Species	Holthouse Reservoir Complex	Potentially Significant	Mitigation Measure Bot-1d: Conduct Groundwater Hydrological Studies	Potentially Significant and Unavoidable
Impact Bot-3: An Increase in the Potential for Invasion and Spread of Noxious Weeds	Sites Reservoir and Dams, Recreation Areas, Road Relocations, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard, Holthouse Reservoir Complex, Delevan Pipeline, TRR Pipeline, Delevan Transmission Line, Delevan Pipeline Intake/Discharge Facilities; Project Buffer	Potentially Significant or Significant	Mitigation Measure Bot-3a: Implement Preventive Actions by Following Weed Control BMPs; Minimize Exposed Ground; Reduce Weed Seed by Removal of On-Site and Off-Site Weeds ;	Less than Significant

Table 13-30
Summary of Mitigation Measures for NODOS Project Impacts to Botanical Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Delevan Pipeline, Delevan Transmission Line	Potentially Significant or Significant	Mitigation Measure Bot-3b:Implement Avoidance Measures in Areas Adjacent to the Delevan National Wildlife Refuge	Less than Significant
Impact Bot-4: Indirect Impacts to Native Plants from Human Disturbance	Recreation Areas, Road Relocations, Holthouse Reservoir Complex, Delevan Pipeline (near Delevan NWR), Project Buffer	Potentially Significant	Mitigation Measure Bot-1c: Avoid/Minimize Loss or Disturbance of Vegetation by Refining the Siting of Facilities and Implementing BMPs	Less than Significant
			Mitigation Measure Bot-4: Implement Vegetation Monitoring in Coordination with USFWS	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Bot-1a: Implement Vegetation Community Mitigation Measures Recommended by USFWS

For the three alternatives (Alternatives A, B, and C), the acreage of permanent vegetation loss within the Recreation Areas and the Road Relocations, as well as the temporary vegetation disturbance within the construction disturbance areas for most facilities, has been estimated. Because these acres were estimated, it may be possible to avoid impacts to certain areas or vegetation communities.

A Habitat Evaluation Procedures assessment of the Primary Study Area was conducted under USFWS' leadership. The results of that assessment, as well as consultation with USFWS pursuant to the Fish and Wildlife Coordination Act, shall aid in the determination of appropriate mitigation measures for the habitat types, and by extension, the corresponding vegetation types, that would be adversely affected within the Primary Study Area. Measures shall include mitigation for impacts to grassland that contains wetlands, is suitable habitat for special-status plant species, and/or contains native grass stands; impacts to blue oak woodlands, including savanna and woodlands with chaparral understory; impacts to riparian vegetation, including distinction between degraded/disturbed areas (e.g., Sites Reservoir) versus mature forest (e.g., Funks Creek at Holthouse Reservoir Complex and Delevan Pipeline Intake/Discharge Facilities); impacts to valley oak woodlands, taking into consideration the small and fragmented sites; and impacts to alkaline wetlands. Mitigation measures could include, but not be limited to, protection, enhancement, restoration, or conservation easement.

Mitigation Measure Bot-1b: Conduct Watershed Hydrological Studies

DWR and Reclamation shall conduct hydrological studies to determine how much of the grassy upland acts as a watershed for the alkaline wetland swale that feeds the downstream alkaline marsh. The studies shall provide guidance regarding how to avoid impacts to the grasslands that direct water to the marsh.

Mitigation Measure Bot-1c: Avoid/Minimize Loss of Vegetation by Refining the Siting of Facilities and Implementing BMPs

DWR and Reclamation shall implement BMPs, protective measures such as fencing and erosion, sedimentation, and dust control, and where possible refine the siting of facilities to minimize construction disturbance to sensitive vegetation communities.

Mitigation Measure Bot-1d: Conduct Groundwater Hydrological Studies

DWR and Reclamation shall conduct hydrological studies to determine the effects of groundwater pressure on the alkaline habitat quality of the swale and the marsh. Measures may include protection of nearby similar vegetation communities, or USFWS may determine the effects are unavoidable and there may be no means of mitigation if there are no equivalent nearby vegetation communities that are feasible to protect or enhance.

Mitigation Measure Bot-1e: Minimize Impacts by Siting Facilities Away from Drainage Swales and using BMPs

DWR and Reclamation shall implement measures that mitigate impacts within the Holthouse Reservoir Complex to alkaline wetland vegetation in the on-site swale to avoid sedimentation of the swale during Project construction, according to recommendations received during consultation with USFWS.

Mitigation Measure Bot-1f: Implement BMPs to Avoid* D*isturbance of Marsh Vegetation in Adjacent Delevan National Wildlife Refuge

DWR and Reclamation shall set back all construction activities and equipment at least 20 feet away from the strip of marshy vegetation along the south end of the Delevan Pipeline construction disturbance area bordering the north edge of Delevan NWR. In addition, construction workers shall be prohibited from entering the NWR. BMPs, including signage on existing fencing, shall also be used to minimize erosion, sedimentation, and dust.

Mitigation Measure Bot-2a: Conduct Pre-Construction Surveys for* Sidalcea keckii *and* Amsinckia lunaris*; if Found, Compensate According to USFWS Guidelines

If either plant species is found during the Project pre-construction surveys, DWR and Reclamation shall immediately report the location and size of occurrences to CDFG and USFWS. If found, DWR and Reclamation shall compensate for the loss or temporary disturbance of either species according to USFWS guidelines and DFG recommendations, which could include protection of known occurrences in nearby habitat. Mitigation measures will be as consistent as possible with the provisions of the CNPS policy guidelines on mitigation of impacts of rare, threatened and endangered plants (CNPS, 1998).

Mitigation Measure Bot-2b: Avoid Occurrences of CNPS List 1B and State- or Federally-Listed Plant Species

DWR and Reclamation shall avoid occurrences of Sidalcea keckii, Amsinckia lunaris, and Lotus rubriflorus by refining the siting of facilities where feasible, and minimizing construction impacts with protection measures and BMPs, such as fencing and erosion, dust, and sedimentation control. Mitigation Measure Bot-2c: Conduct Pre-Construction Surveys for Rare Alkaline Wetland Species in the Managed Alkaline Wetland Parcel of the Delevan Pipeline

DWR and Reclamation shall conduct pre-construction surveys to determine if rare alkaline wetland species are present. If determined to be present during the pre-construction survey, DWR and Reclamation shall compensate for the loss and temporary disturbance of alkaline wetland species according to USFWS guidelines and DFG recommendations, which could include protection of known occurrences in nearby habitat. Mitigation measures will be as consistent as possible with the provisions of the CNPS policy guidelines on mitigation of impacts of rare, threatened and endangered plants (CNPS, 1998).

Mitigation Measure Bot-2c: Conduct Pre-Construction Surveys for Rare Alkaline Wetland Species in the Managed Alkaline Wetland Parcel of the Delevan Pipeline

DWR and Reclamation shall conduct pre-construction surveys to determine if rare alkaline wetland species are present. If determined to be present during the pre-construction surveys, DWR and Reclamation shall compensate for the loss and temporary disturbance of alkaline wetland species according to USFWS guidelines and DFG recommendations, which could include protection of known occurrences in nearby habitat. Mitigation measures will be as consistent as possible with the provisions of the CNPS policy guidelines on mitigation of impacts of rare, threatened and endangered plants (CNPS, 1998).

Mitigation Measure Bot-2d: Conduct Pre-Construction Surveys for Special-Status Plant Species:

DWR and Reclamation shall conduct pre-construction surveys to determine if habitats that support special-status species are present.

Mitigation Measure Bot-2e: Compensate for Loss or Disturbance of CNPS List 4 Species According to CDFG Guidelines

DWR and Reclamation shall compensate for the loss of 13 occurrences CNPS List 4 species pursuant to consultation with DFG, which could include protection of known occurrences in nearby habitat. DWR and Reclamation shall also compensate for the temporary disturbance of four CNPS List 4 species pursuant to consultation with DFG, which could include preserving habitat available for recolonization by three of the four species by revegetating with local natives and using weed-free mulch to prevent post-construction takeover by weeds. Mitigation measures will be as consistent as possible with the provisions of the CNPS policy guidelines on mitigation of impacts of rare, threatened and endangered plants (CNPS, 1998).

Mitigation Measure Bot-3a: Implement Preventive Actions by Following Weed Control BMPs; Minimize Exposed Ground; Reduce Weed Seed by Removal of On-Site and Off-Site Weeds

DWR and Reclamation shall minimize the introduction of new weed seeds into the construction disturbance area or transport weed seeds between construction disturbance areas by following weed control BMPs (e.g., equipment washing). DWR and Reclamation shall minimize the exposed ground within the construction disturbance area that is available for weed colonization or spread by mulching with weed-free materials or planting the exposed ground with native cover crops local to the Project area. In addition, DWR and Reclamation shall reduce the weed seed that is available for invasion into the Project construction disturbance area by appropriate removal of on-site weeds and by implementing selective adjacent off-site weed removal.

Mitigation Measure Bot-3b: Implement Avoidance Measures in Areas Adjacent to the Delevan National Wildlife Refuge

During construction of the Delevan Pipeline and Transmission Line, DWR and Reclamation shall avoid the placement of large staging areas within the portion of the construction disturbance area that borders the Delevan NWR.

Mitigation Measure Bot-4: Implement Vegetation Monitoring in Coordination with USFWS

DWR and Reclamation, in coordination with USFWS, shall monitor the effects of human activities on the health of sensitive areas adjacent to Project facilities.

Implementation of **Mitigation Measures Bot-1b**, **Bot-1c**, **Bot-1f**, **Bot-2b**, **Bot-2c**, **Bot-2d**, **Bot-3a**, **Bot-3b**, and **Bot-4** would reduce the level of significance of Project impacts to botanical resources to **less than significant.**

Implementation of **Mitigation Measures Bot-1a**, **Bot-1d**, **Bot-1e**, **Bot-2a**, and **Bot-2e** would reduce the level of significance of Project impacts to botanical resources to **less than significant,** or they would remain **potentially significant and unavoidable.**

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Figures

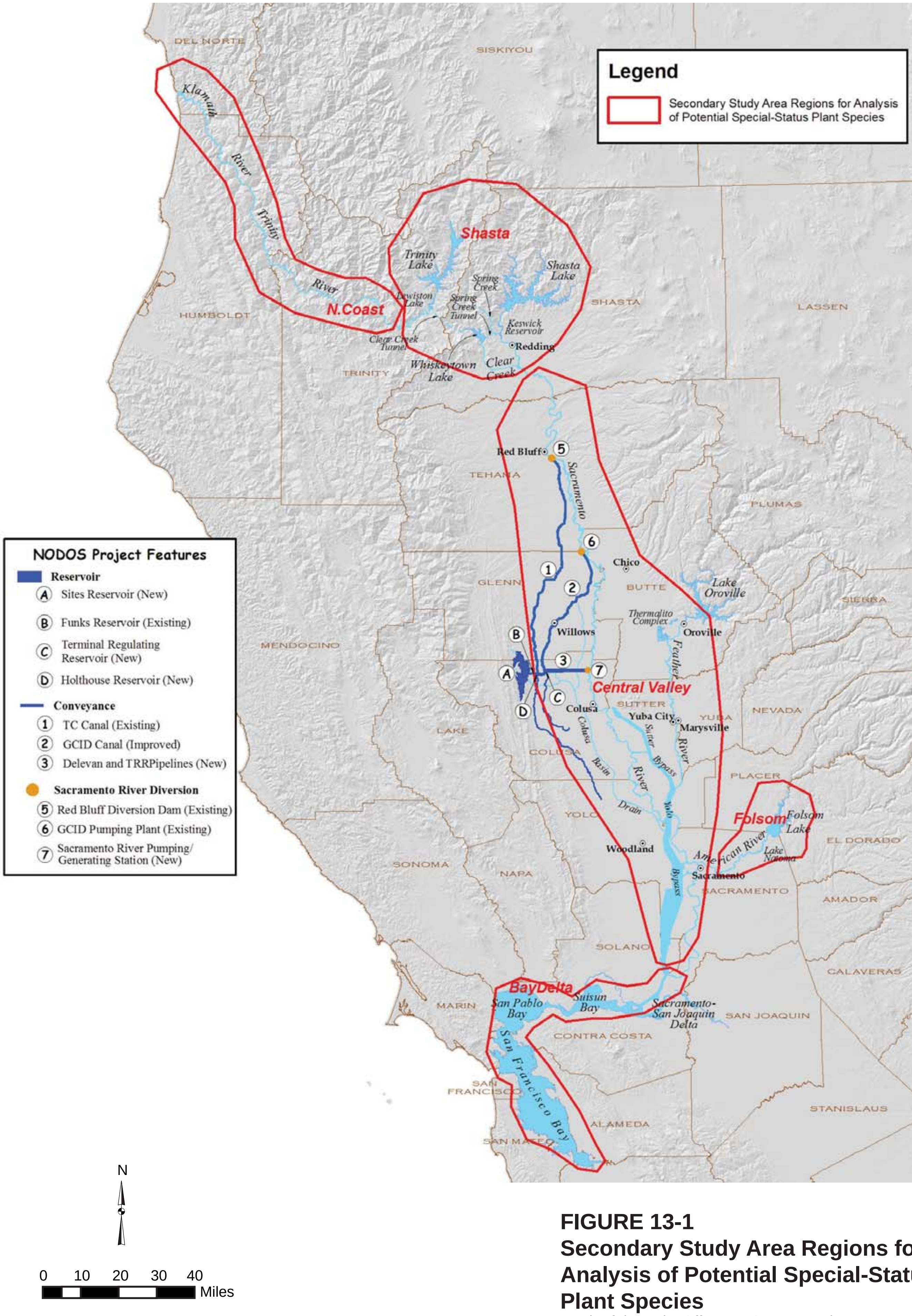

FIGURE 13-1
Secondary Study Area Regions for Analysis of Potential Special-Status Plant Species
North-of-the Delta Offstream Storage Project

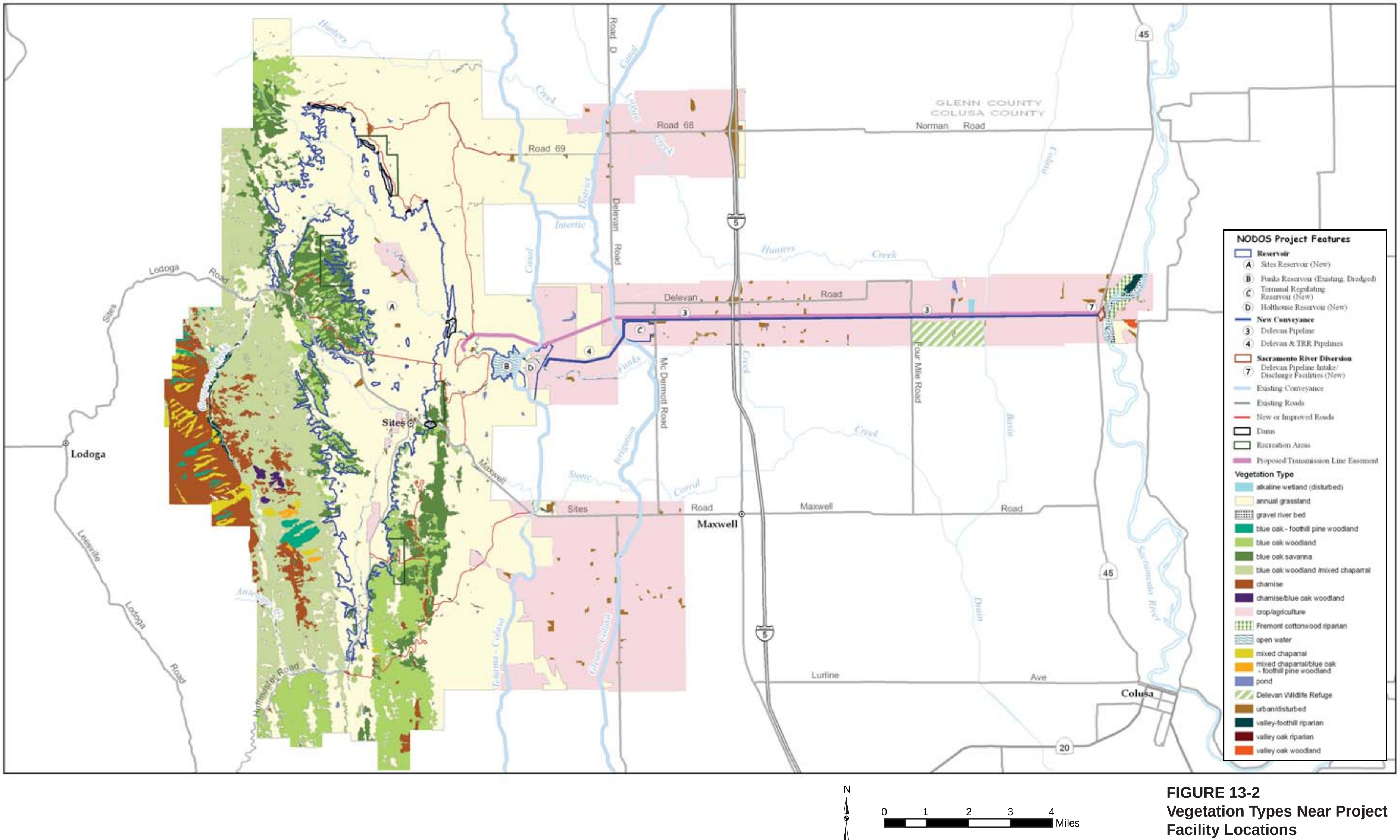

FIGURE 13-2
Vegetation Types Near Project Facility Locations
North-of-the Delta Offstream Storage Project

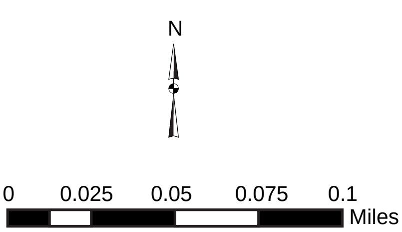

FIGURE 13-3
Riparian Sites Along Funks Creek Impacted by Dams
North-of-the Delta Offstream Storage Project

FIGURE 13-4
Alkaline Wetland Area Overlapping with Holthouse Reservoir Complex
North-of-the Delta Offstream Storage Project

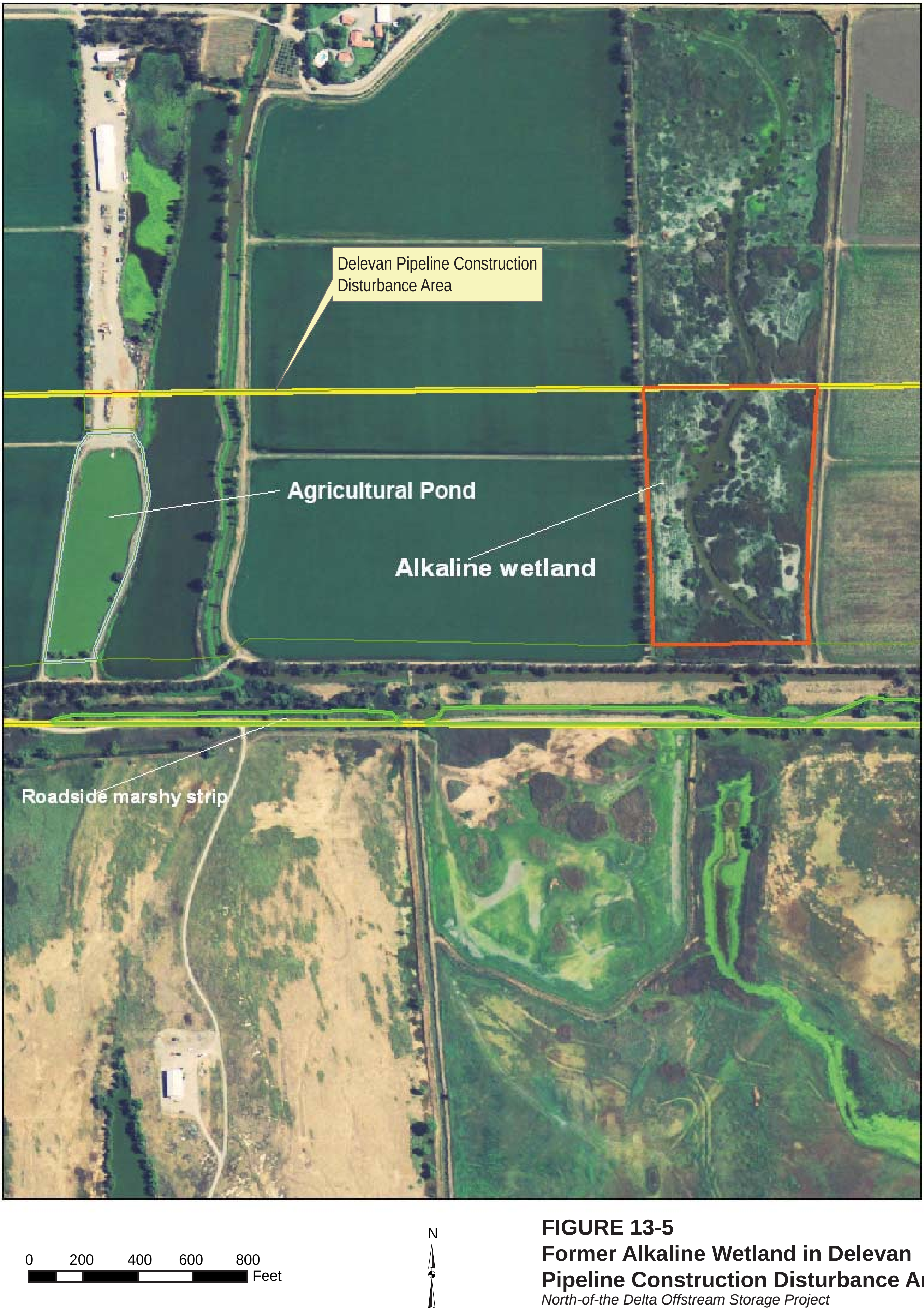

FIGURE 13-5
Former Alkaline Wetland in Delevan Pipeline Construction Disturbance Area
North-of-the Delta Offstream Storage Project

14. Terrestrial Biological Resources

14.1 Introduction

This chapter describes the terrestrial biological resources setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Terrestrial biological resources include wildlife habitats and their associated invertebrates, reptiles, amphibians, birds, and mammals. Wildlife habitat descriptions focus on the value of the vegetation community to wildlife, rather than on the plant species that comprise the habitat type. For more detailed descriptions of vegetation communities, refer to Chapter 13 Botanical Resources.

The regulatory setting for terrestrial biological resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

14.2 Environmental Setting/Affected Environment

14.2.1 Extended Study Area

14.2.1.1 Methodology

Wildlife Habitats and Associated Wildlife

California Department of Fish and Game's (DFG's) California Wildlife Habitat Relationships (WHR) System (DFG, 2008a) was used to identify the potential number of species that could exist within the Extended Study Area. WHR is a predictive model that relates the suitability of each of California's habitat types to individual wildlife species based on their reproductive, cover, and feeding requirements. For the WHR analysis of the contracted municipal, industrial, and agricultural water deliveries within the Extended Study Area, only the urban and agricultural habitat types were considered. WHR separates agriculture into crop types. The crops that could be affected by a more reliable water source are rice, irrigated grain crops, irrigated row and field crops, irrigated hayfields, evergreen orchard, deciduous orchard, pasture, and vineyard.

A WHR species list was generated for each habitat type listed above based on their occurrence within the 39 counties of the CVP and SWP service areas. Because only ten counties can be entered into the WHR System at one time, 4 species lists were generated and then merged for each habitat type. The habitat types listed above may not occur in every county within the Extended Study Area.

For the analysis of wildlife refuges and wildlife areas (WAs) that receive Level 4 water deliveries within the Extended Study Area[1], a WHR species list was generated for fresh emergent wetland habitat based on its occurrence within 7 counties (Colusa, Fresno, Glenn, Kern, Kings, Merced, and Tulare).

[1]The Level 4 water deliveries that could be affected by Project operation are contracted to the Sacramento and Colusa NWRs within the Sacramento River Basin; to the West Bear Creek unit of the San Luis NWR Complex and the Merced unit of the Merced NWR, as well as the Los Banos, Volta, and Mendota WAs, the China Island and Salt Slough units of the North Grasslands WA, and private wetlands of the Grassland Resource Conservation District within the San Joaquin River Basin; and to the Kern and Pixley NWRs within the Tulare Lake Basin.

For the analysis of wildlife that occur within San Luis Reservoir, a WHR species list was generated for lacustrine habitat based on its occurrence in Merced County.

Special-Status Wildlife Species

A list of special-status wildlife species that may occur within the service areas of the Extended Study Area was generated using the Sacramento U.S. Fish and Wildlife Service (USFWS) Office's Endangered Species Program website (USFWS, 2009a). The list includes federal endangered, threatened, and candidate species that may be affected within 28 of the 39 counties of the Extended Study Area that are within its jurisdiction, as well as areas of designated critical habitat. Critical habitat is habitat that is essential to the conservation of the species and is protected pursuant to the federal Endangered Species Act (FESA). The USFWS' Endangered Species Database (TESS) was used to generate species lists for Monterey, San Benito, Santa Barbara, Santa Cruz, and Ventura counties (USFWS, 2009b). The Carlsbad Fish and Wildlife Office's website was used to access a list of species by county within its jurisdiction, which includes Imperial, Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties (USFWS, 2009c).

A list of special-status wildlife species was also generated using the Sacramento Fish and Wildlife Office's Endangered Species Program website (USFWS, 2009a) for the four USGS 7.5 minute quadrangles within which San Luis Reservoir is located (map numbers are provided in parentheses): Los Banos Valley (384A), Mariposa Peak (384B), Pacheco Pass (404C), and San Luis Dam (404D).

The California Natural Diversity Database (CNDDB) *State and Federally Listed Endangered and Threatened Animals of California* (October, 2009) and *Special Animals* (July, 2009) lists were also consulted for State-listed species and species of special concern (DFG, 2009a).

Commercially or Recreationally Important Wildlife Species

The agricultural lands and wildlife refuges within the Extended Study Area provide seasonal and year-round habitat for a variety of commercially or recreationally important wildlife species. The WHR System (DFG, 2008a) was used to generate a list of all harvest (hunted or trapped) species that could occur within the rice, irrigated grain crops, irrigated row and field crops, irrigated hayfields, evergreen orchard, deciduous orchard, pasture, and vineyard habitats within the 39 counties that comprise the Extended Study Area. Because only ten counties can be entered into the WHR System at one time, four species lists were generated and then merged for each habitat type. A separate list was generated for all harvest species that could occur within fresh emergent wetland habitat within the counties that are in the Extended Study Area wildlife refuges and areas (Colusa, Fresno, Glenn, Kern, Kings, Merced, and Tulare). Finally, a list of harvest species that could occur within the lacustrine habitat of San Luis Reservoir was generated for Merced County.

14.2.1.2 Wildlife Habitats and Associated Wildlife

Urban

Urban habitat includes vegetation in city parks, tree strips along city streets, residential gardens, and landscaping, such as shrubs, shade trees, and lawns. Vegetation in urban habitat is comprised of native and non-native species that usually receive some level of maintenance. The species found in urban habitat are greatly influenced by the type of habitat that is adjacent to the urban area; most large cities are surrounded by agricultural and grazing lands. Many non-native wildlife species thrive in urban areas (Mayer and Laudenslayer, 1988a).

Up to 225 species (170 birds, 43 mammals, 8 reptiles, and 4 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with urban habitat include the Virginia opossum (*Didelphis virginiana*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), house mouse (*Mus musculus*), striped skunk (*Mephitis mephitis*), western fence lizard (*Sceloporus occidentalis*), pacific chorus frog (*Pseudacris egilla*), rock pigeon (*Columba livia*), numerous hummingbird species, western scrub jay (*Aphelocoma californica*), yellow-billed magpie (*Pica nuttalli*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), and American robin (*Turdus migratorius*).

Rice

Rice is a flood-irrigated annual crop that is usually planted in the spring and harvested in the fall. Rice is typically grown in leveed fields that have heavier clay soils that hold water well – many rice field locations historically supported seasonal wetlands. Flooded rice fields support many species that were once supported by wetlands, and some waterfowl species depend on waste rice (Mayer and Laudenslayer, 1988a).

Up to 196 species (137 birds, 33 mammals, 20 reptiles, and 6 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with rice habitat include the ring-necked pheasant (*Phasianus colchicus*), sandhill crane (*Grus canadensis*), greater white-fronted goose (Anser *albitrons*), common muskrat (*Ondatra zibethicus*), numerous waterfowl species, herons, egrets, and the giant garter snake (*Thamnophis gigas*).

Irrigated Grain Crops

Irrigated grain and seed crops include corn, safflower, dry beans, milo, grain sorghum, and sunflowers. These crops are annuals that are typically planted in the spring and harvested in the summer or fall. Wheat and barley are also irrigated grain crops, but are typically planted in the fall and harvested in the spring. Approximately 50 percent of all barley crops and 75 percent of wheat crops are irrigated. Irrigated grain and seed crops are established on very fertile soils, which historically supported native vegetation that provided high habitat suitability and an associated abundance of wildlife. Irrigated grain and seed crops do not support that same abundance of wildlife, but several species have adapted to this habitat type, and some species depend on the waste grain that remains in the field after harvesting (Mayer and Laudenslayer, 1988a).

Up to 173 species (108 birds, 53 mammals, 5 reptiles, and 7 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated grain and seed crops include the black rat (*Rattus rattus*), Botta's pocket gopher, wild pig (*Sus scrofa*), mule deer (*Odocoileus hemionus*), gopher snake (*Pituophis catenifer*), greater white-fronted goose, Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), northern harrier (*Circus cyaneus*), ring-necked pheasant, killdeer (*Charadrius vociferus*), barn owl (*Tyto alba*), tri-colored blackbird (*Agelaius tricolor*), herons, egrets, and numerous bat species.

Irrigated Row and Field Crops

Irrigated row and field crops include cotton, asparagus, strawberries, tomatoes, lettuce, melons, broccoli, cauliflower, carrots, celery, cucumber, potatoes, and onions. Most of these crops are annual, but some, such as asparagus and strawberries, are perennial. Similar to irrigated grain and seed crops, most row and field crops are planted on very fertile soils and do not support the abundance of wildlife that the historical native vegetation once supported (Mayer and Laudenslayer, 1988a).

Up to 116 species (46 birds, 51 mammals, 10 reptiles, and 9 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated row and field crops include the black-tailed jackrabbit (*Lepus californicus*), California ground squirrel, Botta's pocket gopher, western harvest mouse (*Reithrodontomys megalotis*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snow goose (*Chen caerulescens*), ring-necked pheasant, killdeer, barn owl, red-winged blackbird (*Agelaius phoeniceus*), and numerous bat species.

Irrigated Hayfield

Irrigated hayfields include alfalfa fields and grass hayfields. Alfalfa fields are plowed every three to six years, with some fields plowed every year. Within the Central Valley, alfalfa fields can be harvested as many as 6 times per year. Alfalfa fields are an important part of a crop rotation, because alfalfa renews soil nitrogen. Grass hayfields are intensively mowed and managed fields of annually-planted introduced grasses, or can also be naturally-occurring perennial grasses and sedges. A mixture of these grass types is common. This habitat provides a high quality seasonal resource for many wildlife species, but frequent harvesting makes this habitat type unsuitable for ground nesting species (Mayer and Laudenslayer, 1988a).

Up to 223 species (158 birds, 58 mammals, 6 reptiles, and 1 amphibian) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated hayfields include the great blue heron, great egret, cattle egret (*Bubulcus ibis*), tundra swan (*Cygnus columbianus*), several goose species, mallard, northern pintail (*Anas acuta*), northern harrier, ring-necked pheasant, sandhill crane, long-billed curlew (*Numenius americanus*), burrowing owl (*Athene cunicularia*), red-winged blackbird, Botta's pocket gopher, and gopher snake.

Evergreen Orchard

Evergreen orchards are single species tree-dominated habitats in which the trees are arranged in a linear pattern and are spaced evenly. Understory species may include low-growing grasses or other herbaceous plants, but evergreen orchards are typically managed to prevent any understory growth. Evergreen orchards include avocados, dates, grapefruit, lemons, limes, olives, oranges, tangerines, and tangelos. Evergreen orchards are planted on fertile soil that once supported diverse habitats and numerous wildlife species. This heavily managed monoculture does not support the abundance of wildlife once associated with the native vegetation, but some species have adapted and have become pests by feeding on the leaves and fruit of the trees. Other wildlife species use evergreen orchards for cover and nesting sites, with the year-round tree canopy providing shelter from hot or cold temperatures (Mayer and Laudenslayer, 1988a).

Up to 90 species (30 birds, 45 mammals, 9 reptiles, and 6 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with evergreen orchards include the mourning dove (*Zenaida macroura*), California quail (*Callipepla californica*), barn owl, European starling, western gray squirrel (*Sciurus griseus*), Botta's pocket gopher, black-tailed jackrabbit, and mule deer.

Deciduous Orchard

Similar to evergreen orchards, deciduous orchards are single species tree-dominated habitats in which the trees are arranged in a linear pattern and are spaced evenly. Understory species may include low-growing grasses or other herbaceous plants, but some deciduous orchards are managed to prevent any understory growth. Deciduous orchards include almonds, apples, apricots, cherries, figs, nectarines, peaches, pears, pecans, pistachios, plums, prunes, and walnuts. The tree canopy can provide shelter from heat, but does not provide much cover from rain and cold during the winter after the leaves have dropped (Mayer and Laudenslayer, 1988a).

Up to 167 species (107 birds, 48 mammals, 9 reptiles, and 3 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with deciduous orchards include the northern flicker (*Colaptes auratus*), western scrub jay, American crow (*Corvus brachyrhynchos*), oak titmouse (*Baeolophus inornatus*)), Brewer's blackbird (*Euphagus cyanocephalus*), American robin, western gray squirrel, California ground squirrel, raccoon (*Procyon lotor*), and black bear (*Ursus americanus*).

Pasture

Pasture habitat is a mix of perennial grasses and legumes that is irrigated and used for grazing livestock. The height of the vegetation depends on management practices, the type of livestock, stocking rates, and grazing duration. Pasture is typically planted on soils that are not suitable for other crops. Ground-nesting birds will nest in pasture habitat when adequate vegetation is present at the start of the nesting season, and flood-irrigated pasture provides feeding and roosting sites for shorebirds, wading birds, and waterfowl. Large mammals, such as deer, antelope, and elk will graze pastures if adjacent escape cover exists (Mayer and Laudenslayer, 1988a).

Up to 108 species (9 birds, 69 mammals, 13 reptiles, and 17 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with pasture include the bullfrog (*Rana catasbeiana*), burrowing owl, broad-footed mole (*Scapanus latimanus*), black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, San Joaquin pocket mouse (*Perognathus inornatus*), pronghorn (*Antilocapra americana*), and gopher snake.

Vineyard

Vineyards are composed of a single species planted in rows, with the vines supported by a trellis. The area beneath the vines is usually managed to prevent plant growth, but the area between rows is typically planted with grasses or other herbaceous plants. Vineyards include boysenberries, raspberries, kiwifruit, and grapes. Vineyards are planted on highly fertile soils that once supported diverse native habitats which, in turn, supported an abundance and diversity of wildlife. Some wildlife have adapted to vineyards by browsing on the vines, eating the fruit, or using the habitat for nesting and cover. Raptors use vineyards to feed on rodents and other crop pests (Mayer and Laudenslayer, 1988a).

Up to 105 species (43 birds, 46 mammals, 10 reptiles, and 6 amphibians) may be found within this habitat type within the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with vineyards include the mule deer, black-tailed jackrabbit, California ground squirrel, mourning dove, barn owl, northern mockingbird, Brewer's blackbird, house finch, Botta's pocket gopher, and American kestrel (*Falco sparverius*).

Fresh Emergent Wetland

Fresh emergent wetlands are one of the most productive wildlife habitats in California. Located in land depressions, these wetlands are flooded frequently and are dominated by rooted perennial vegetation, such as cattail (*Typha* sp.), bulrush (*Scirpus* sp.), and arrowhead (*Sagittaria* sp.). The wetlands of the wildlife refuges and WAs are primarily managed to provide wintering habitat for waterfowl, but many other species benefit from their management practices, including special-status species that depend on ponded water for all or part of their life cycles (Mayer and Laudenslayer, 1988a).

Up to 180 species (119 birds, 32 mammals, 12 reptiles, and 17 amphibians) may be found within this habitat type within the wildlife refuges and WAs in the Extended Study Area (DFG, 2008a). Wildlife species commonly associated with fresh emergent wetland include the California newt (*Taricha torosa*), western spadefoot (*Spea hammondii*), Pacific chorus frog, California red-legged frog (*Rana draytonii*), eared grebe (*Podiceps nigricollis*), black-crowned night heron (*Nycticorax nycticorax*), Canada goose, mallard, northern shoveler (*Anas clypeata*), sandhill crane, white-faced ibis (*Plegadis chihi*), short-eared owl (*Asio flammeus*), red-winged blackbird, American beaver (*Castor canadensis*), common muskrat, American mink (*Mustela vison*), raccoon, western pond turtle (*Actinemys marmorata*), and giant garter snake.

Lacustrine

Lacustrine habitat includes permanently flooded lakes and reservoirs, intermittent lakes, and ponds – some of which may be shallow enough to support rooted plants (Mayer and Laudenslayer, 1988a). Operations at San Luis Reservoir cause severe reservoir level fluctuations, but the fluctuations are gradual enough to support some wetland and riparian scrub vegetation species in seeps within the drawdown zone.

Up to 130 species (103 birds, 14 mammals, 5 reptiles, and 8 amphibians) may be found within this habitat type within Merced County at San Luis Reservoir (DFG, 2008a). Wildlife species commonly associated with lacustrine open-water habitat include the bald eagle (*Haliaeetus leucocephalus*), western grebe (*Aechmophorus occidentalis*), double-crested cormorant (*Phalacrocorax auritus*), common loon (*Gavia immer*), and osprey (*Pandion haliaetus*). Bats and some insectivorous bird species can be found foraging over open water.

Wildlife species commonly associated with the nearshore portion of lacustrine habitat include the great blue heron, snowy egret (*Egretta thula*), killdeer, and long-billed curlew. Shallow areas also provide habitat for amphibians and reptiles. Lacustrine habitat also serves as a source of drinking water for wildlife that uses adjacent habitat types.

14.2.1.3 Special-Status Wildlife Species

More than 175 State- or federally-listed threatened or endangered species, candidate species, and State species of special concern may occur within the 39 counties that are included in the Extended Study Area (USFWS, 2009a; USFWS, 2009b; USFWS, 2009c; DFG, 2009a). The counties of the Extended Study Area also include numerous areas of designated critical habitat. However, most of these special-status species would be unlikely to occur in, or depend upon, the urban habitat type.

Although agricultural habitat types tend to be of less value to wildlife than native habitats, some special-status species have adapted to agricultural lands. Species, such as the Swainson's hawk (*Buteo swansoni*), greater sandhill crane (*Grus canadensis tabida*), and bank swallow (*Riparia riparia*) use agricultural fields as foraging areas. Flooded fields and deciduous orchards have the potential to meet the cover, feeding, and reproduction needs of the giant garter snake and the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), respectively (DFG, 2008a).

The fresh emergent wetlands of the wildlife refuges and WAs within the Extended Study Area have the potential to meet the cover, feeding, and reproduction needs of special-status species such as the

California tiger salamander (*Ambystoma californiense*), California red-legged frog, greater sandhill crane, and giant garter snake (DFG, 2008a).

The lacustrine habitat of San Luis Reservoir has the potential to support several special-status wildlife species, including the bald eagle and osprey. However, there are no known occurrences of bald eagles or osprey within the four USGS 7.5 minute quadrangles within which San Luis Reservoir is located. The nearest known locations are in eastern Merced County for both species (DFG, 2009a). No bald eagle perch sites have been documented around the reservoir, which is surrounded by annual grassland and blue oak woodland habitats, but occasionally winter use by bald eagles may occur (Reclamation, 2007). The open water habitat of the reservoir has the potential to support special-status species, such as the common loon, redhead (*Aythya americana)*, Barrow's goldeneye (*Bucephala islandica)*, black tern (*Chlidonias niger)*, western snowy plover (*Charadrius alexandrinus nivosus)*, and American white pelican (*Pelecanus erythrorhyncos)*.

14.2.1.4 Commercially or Recreationally Important Wildlife Species

Many of the harvest species found on agricultural lands are considered to be crop pests, and landowners consequently provide hunting opportunities to control these species. Up to 67 harvest species (39 birds, 27 mammals, and 1 amphibian) may occur within the urban and agricultural habitat types within the Extended Study Area, and up to 38 harvest species (26 birds, 11 mammals, and 1 amphibian) may occur within the fresh emergent wetland habitat on the WAs and refuges within the Extended Study Area (DFG, 2008a). Seasonal waterfowl hunting occurs at San Luis Reservoir. Up to 27 waterfowl harvest species may occur within the lacustrine habitat of this reservoir.

Harvest birds include waterfowl, such as the mallard and greater white-fronted goose, and upland game birds, such as the ring-necked pheasant and wild turkey (*Meleagris gallopavo*). The WAs and refuges within the Extended Study Area have wetlands that are managed for waterfowl and provide waterfowl hunting opportunities to the public in designated areas. Private hunting opportunities exist on the flooded rice fields that are also managed for waterfowl.

Harvest mammals include furbearers, such as the American beaver and American mink; small game, such as the black-tailed jackrabbit and western gray squirrel; and big game, such as the black bear, wild pig, and mule deer.

14.2.2 Secondary Study Area

14.2.2.1 Methodology

<u>Wildlife Habitats and Associated Wildlife</u>

The WHR System (DFG, 2008a) was used to identify the potential number of species that could occur within the 22 counties included in the Secondary Study Area. A WHR species list was generated for the lacustrine, riverine, estuarine, montane riparian, valley foothill riparian, fresh emergent wetland, saline emergent wetland, barren, rice, irrigated grain crops, and irrigated row and field crops habitat types.

Because only 10 counties can be entered into the WHR System at one time, three species lists were generated and then merged for each habitat type.

<u>Special-Status Wildlife Species</u>

A list of special-status wildlife species that may occur within the Secondary Study Area was generated using the Sacramento Fish and Wildlife Office's Endangered Species Program website (USFWS, 2009a).

The list includes federal endangered, threatened, and candidate species that may be affected within the 19 of the 22 counties within the Secondary Study Area that are within their jurisdiction, as well as areas of designated critical habitat. The Arcata Fish and Wildlife Office's Species List Search page was used to generate species lists for Del Norte, Humboldt, and Trinity counties (USFWS, 2009d). The CNDDB *State and Federally Listed Endangered and Threatened Animals of California* (October 2009) and *Special Animals* (July 2009) lists were also consulted for State-listed species and species of special concern (DFG, 2009a). The generated lists include the entire county, and therefore, may contain species that would be found within the county, but not within the specific habitat types listed above. In addition, CNDDB's Rarefind 4 was queried for known occurrences within the 22 counties in the specified habitat types.

Commercially or Recreationally Important Wildlife Species

The Secondary Study Area provides seasonal and year-round habitat for a variety of commercially or recreationally important wildlife species. The WHR System (DFG, 2008a) was used to generate a list of all harvest (hunted or trapped) species that could occur within the lacustrine, riverine, estuarine, valley foothill riparian, fresh emergent wetland, saline emergent wetland, and barren habitat types within the 22 counties listed above. Because only ten counties can be entered into the WHR System at one time, three species lists were generated and then merged. A separate list was generated of all harvest species that could exist within the rice, irrigated grain crops, and irrigated row and field crops habitat types within the bypasses of Yolo and Sutter counties.

14.2.2.2 Wildlife Habitats and Associated Wildlife

Lacustrine

Lacustrine habitat is described in the Extended Study Area discussion. Lacustrine habitat within the Secondary Study Area primarily exists at the reservoirs, as well as at the Thermalito Forebay and Afterbay. The Forebay does not experience large water level fluctuations and, is therefore, able to support emergent aquatic vegetation (DWR, 2007a). Portions of the drawdown zone at Shasta Lake are also able to support limited amounts of early successional vegetation, such as willow, cottonwood, and various grasses and forbs (Reclamation, 2004).

Up to 166 species (120 birds, 18 mammals, 9 reptiles, and 19 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with lacustrine habitat are listed in the Extended Study Area discussion (Section 14.2.1.2).

Riverine

Riverine habitat includes free-flowing streams and rivers (Mayer and Laudenslayer, 1988a). Riverine habitat within the Secondary Study Area includes the Feather, Sacramento, Trinity, Lower Klamath, and American rivers, as well as Clear and Spring creeks.

Up to 159 species (101 birds, 26 mammals, 8 reptiles, and 24 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with the open-water zones of large rivers include the osprey, bald eagle, gulls, terns, and waterfowl. Insectivorous species, such as the Yuma myotis (*Myotis yumanensis*), bank swallow, black swift (*Cypseloides niger*), and black phoebe forage over open water.

Wildlife species commonly associated with the near-shore portions of rivers and streams include the belted kingfisher (*Megaceryle alcyon*), mallard, great egret, killdeer, American dipper (*Cinclus* *mexicanus*), foothill yellow-legged frog (*Rana boylii*), western pond turtle, northern river otter, American mink, and common muskrat. Riverine habitat also serves as a source of drinking water for wildlife.

Estuarine

Estuarine habitat occurs on periodically or permanently flooded substrates where tidal seawater mixes with, and is diluted by, flowing fresh water (Mayer and Laudenslayer, 1988a). Estuaries within the Secondary Study Area include the San Francisco, San Pablo, and Suisun bays, the mouth of the Klamath River, and the Sacramento-San Joaquin Delta.

The salinity of estuarine habitats varies seasonally depending on freshwater inflow and tidal action. Estuarine habitat has a low number of species, but a high density of those species that can tolerate the fluctuating salinity levels, such as benthic (bottom dwelling) invertebrates and plankton. Many bird and mammal species use estuarine habitat for feeding, resting, reproduction, and cover. Estuarine sub-tidal habitat supports eel grass (*Zostera* sp.), which the brant (*Branta bernicla*) depends on (Mayer and Laudenslayer, 1988a).

Up to 127 species (120 birds and 7 mammals) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with estuaries include the common loon, western grebe, double-crested cormorant, red-breasted merganser (*Mergus serrator*), lesser scaup (*Aythya affinis*), black-necked stilt (*Himantopus mexicanus*), Caspian tern (*Hydroprogne caspia*), and harbor seal (*Phoca vitulina*).

Montane Riparian

Montane riparian habitat usually occurs as a narrow, often dense, grove of broad-leaved winter deciduous trees, such as maple (*Acer* sp.), cottonwood (*Populus* sp.), and alder (*Alnus* sp.), with a sparse understory. This habitat type is found associated with montane lake, ponds, seeps, bogs, and meadows, as well as rivers, streams and springs, typically below 2,440 meters (m) (8,000 feet) in elevation (Mayer and Laudenslayer, 1988a).

Within the Secondary Study Area, montane riparian habitat that could be affected by Project operation exists along the Trinity and Klamath rivers. In Trinity County, dominant tree species include bigleaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), black cottonwood (*Populus balsamifera)*, and black willow (*Salix gooddingii*). Typical understory species include mugwort (*Artemisia douglasiana*), virgin's bower (*Clematis ligusticifolia*), American dogwood (*Cornus sericea*), Oregon golden-aster (*Heterotheca oregona*), straggly gooseberry (*Ribes divaricatum*), Himalayan blackberry (*Rubus discolor*), California blackberry (*Rubus ursinus*), narrow-leaved willow, arroyo willow (*Salix lasiolepis*), and California wild grape (*Vitis californica*) (Reclamation, 2009).

Up to 300 species (159 birds, 91 mammals, 22 reptiles, and 28 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with montane riparian habitat include the roughskin newt (*Taricha granulosa*), Pacific chorus frog, Pacific giant salamander (*Dicamptodon tenebrosus*), osprey, peregrine falcon, great horned owl, belted kingfisher, vagrant shrew, long-eared myotis (*Myotis evotis*), western harvest mouse, common muskrat, American mink, California mountain kingsnake (*Lampropeltis zonata*), and western terrestrial garter snake (*Thamnophis elegans*).

Valley Foothill Riparian

Valley foothill riparian habitat occurs in valleys and foothills and is usually associated with low-velocity flows or floodplains. The canopy is dominated by cottonwood, California sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). The sub-canopy is dominated by white alder, box elder (*Acer negundo*), and Oregon ash (*Fraxinus latifolia*). The typically impenetrable understory shrub layer includes wild grape, California blackberry, poison oak (*Toxicodendron diversilobum*), and willows. Elderberry shrubs (*Sambucus* sp.) are often associated with this habitat type (Mayer and Laudenslayer, 1988a).

DFG has designated riparian habitat as a sensitive habitat because of its limited abundance and high value to wildlife. Numerous wildlife species use this habitat type for food, water, migration corridors, escape habitat, nesting habitat, and thermal cover. Valley foothill riparian habitat exists within the Secondary Study Area along the rivers and creeks, as well as within the Yolo and Sutter bypasses. Most remaining stretches of riparian habitat are narrow and fragmented. However, the Oroville WA contains over 3,000 acres of valley foothill riparian habitat, representing the largest remaining block of riparian habitat along the Feather River (DWR, 2007b).

Up to 312 species (188 birds, 73 mammals, 27 reptiles, and 24 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with valley foothill riparian habitat include the California slender salamander (*Batrachoseps attenuatus*), foothill yellow-legged frog, green heron (*Butorides virescens*), osprey, California quail, great horned owl (*Bubo virginianus*), belted kingfisher, downy woodpecker (*Picoides pubescens*), black phoebe, bank swallow, canyon wren (*Catherpes mexicanus*), vagrant shrew (*Sorex vagrans*), several bat species, western gray squirrel, ringtail (*Bassariscus astutus*), American mink, western pond turtle, western skink (*Eumeces skiltonianus*), common kingsnake (*Lampropeltis getula*), and western aquatic garter snake (*Thamnophis couchii*). The WHR System does not include invertebrates, but the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is also associated with this habitat type when elderberry shrubs are present.

Fresh Emergent Wetland

Fresh emergent wetland is described in the Extended Study Area discussion (Section 14.2.1.2). Fresh emergent wetland occurs throughout the secondary study area at the confluence of streams and reservoirs, in landscape depressions along the creeks and rivers, in backwater areas of the rivers, in dredger ponds, around Thermalito Forebay and Afterbay, and in the Yolo and Sutter bypasses. Wetlands also occur in seeps and springs above the high water lines of the reservoirs, but typically are absent within the drawdown zone of the reservoirs. More than 850 acres of wetlands are present within the Thermalito Complex (DWR, 2007b; Reclamation, 2009).

Up to 189 species (121 birds, 36 mammals, 12 reptiles, and 20 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with fresh emergent wetland are listed in the Extended Study Area discussion (Section 14.2.1.2).

Saline Emergent Wetland

Saline emergent wetland consists of salt or brackish marshes and contains vegetation, such as cordgrass (*Spartina* sp.), pickleweed (*Salicornia* sp), saltgrass (*Distichlis spicata*), and glasswort (*Salicornia* sp.). These wetlands occur above intertidal sand and mud flats and below upland communities not subject to tidal action, mainly along the margins of bays, lagoons, and estuaries. Within the Secondary Study Area, saline emergent wetland habitat occurs around San Pablo Bay, Suisun Bay, and portions of the Delta, with the largest stands of saline emergent wetland occurring in San Francisco Bay (Mayer and Laudenslayer, 1988a).

Up to 119 species (112 birds and 17 mammals) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with saline emergent wetland include the eared grebe, black-crowned night heron, peregrine falcon (*Falco peregrinus*), California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail (*Rallus longirostris obsoletus*), short-eared owl, red-winged blackbird, salt marsh harvest mouse (*Reithrodontomys raviventris*), and American mink.

Barren

Barren habitat is defined by the absence of vegetation, although opportunistic grasses and forbs or weedy species may occur. Barren habitat exists in many forms throughout the Secondary Study Area. The mudflats surrounding estuarine, fresh emergent wetland, and saline emergent wetland habitats are considered to be barren habitat. Along rivers, barren habitat includes vertical river banks and canyon walls, sealed rip-rap features, dredger tailings, rock outcrops, and gravel bars adjacent to the rivers. Barren habitat also includes the drawdown zone of reservoirs (Mayer and Laudenslayer, 1988a; Reclamation, 2004; Reclamation, 2009).

Up to 124 species (86 birds, 35 mammals, 2 reptiles, and 1 amphibian) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with barren habitat include the killdeer, bank swallow, belted kingfisher, black swift and American avocet (*Recurvirostra americana*).

Rice

Rice habitat is described in the Extended Study Area discussion (Section 14.2.1.2). Rice is the predominant crop type within the Yolo and Sutter bypasses. Up to 194 species (136 birds, 33 mammals, 19 reptiles, and 6 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with rice are listed in the Extended Study Area discussion (Section 14.2.1.2).

Irrigated Grain Crops

Irrigated grain crops are described in the Extended Study Area discussion (Section 14.2.1.2). Crops, such as corn and safflower, are grown in the Secondary Study Area within the Yolo and Sutter bypasses. Up to 157 species (98 birds, 50 mammals, 5 reptiles, and 4 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated grain crops are listed in the Extended Study Area discussion (Section 14.2.1.2).

Irrigated Row and Field Crops

Irrigated row and field crops are described in the Extended Study Area discussion (Section 14.2.1.2). Crops, such as tomatoes and melons, are grown in the Secondary Study Area within the Yolo and Sutter bypasses. Up to 107 species (43 birds, 50 mammals, 9 reptiles, and 5 amphibians) may be found within this habitat type within the Secondary Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated row and field crops are listed in the Extended Study Area discussion (Section 14.2.1.2).

14.2.2.3 Special-Status Wildlife Species

More than 60 State- and federally-listed species, candidate species, and species of special concern may occur within the counties of the Secondary Study Area (USFWS, 2009a; USFWS, 2009d; DFG, 2009a). These counties also include numerous areas of designated critical habitat. Many of these special-status species would not be affected by changes in stream flow patterns or fluctuating reservoir levels. Thirteen of these special-status species could be affected by changes to existing facility operations in the Secondary Study Area as a result of the Project. The 13 listed species that could be affected by these operational changes are discussed below.

Reptiles and Amphibians

California Red-Legged Frog

The California red-legged frog inhabits humid forests, woodlands, grasslands, and stream sides where dense shrubby or riparian vegetation provides good cover. This species can be found in streams, lakes, reservoirs, ponds, or other permanent sources of water, but is generally absent from water sources that are inhabited by the bullfrog (Stebbins, 1985, Stebbins and Cohen, 1995).

The California red-legged frog is known to occur in streams in 13 of the 22 counties within the Secondary Study Area. The locations of those occurrences include tributary creeks, coastal streams, and small ponds and lakes (DFG, 2010b). In 2002 the USFWS prepared the *Recovery Plan for the California Red-Legged Frog*. The objective of the plan is to reduce threats and improve the population status of the California red-legged frog sufficiently to warrant delisting. The plan contains maps of recovery units. Within the recovery units, there are several areas that have been identified as core areas where recovery actions will be focused. Two of those core areas are located within the Secondary Study Area. The Cottonwood Creek Core Area includes Lower Cottonwood Creek and its confluence with the Sacramento River in Shasta and Tehama counties. The South San Francisco Bay Core Area includes the edge of San Francisco Bay within Marin County (USFWS, 2002).

Foothill Yellow-Legged Frog

The foothill yellow-legged frog ranges from the Oregon border to Los Angeles County along the Coast Ranges, in northern California west of the Cascade Crest, and along the Sierras to Kern County at elevations ranging from near sea level to 1942 m (6,370 ft). This frog is found in a variety of habitats in or near rocky streams, including valley foothill riparian, mixed chaparral, mixed conifer, and wet meadow.

This species uses submerged rock or sediment as cover when disturbed, and seeks cover under rocks instream or near water during periods of inactivity. The foothill yellow-legged frog is rarely found away from a permanent water source, and tadpoles require a permanent water source for up to four months during development. Breeding and egg-laying occur from mid-March to May following spring flooding (Mayer and Laudenslayer, 1988b).

The foothill yellow-legged frog is known to occur in 20 of the 22 counties within the secondary study area, but is not found in the valley portions of many of those counties. Foothill yellow-legged frogs have been observed in the canyon reach of lower Clear Creek downstream of Whiskeytown Dam, and are known to occur in the Trinity River from Lewiston Dam to the North Fork Trinity River (Reclamation, 2009; BLM, 2008).

Giant Garter Snake

The giant garter snake inhabits agricultural wetlands and other waterways, such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. Because of the direct loss of natural habitat from agricultural and urban development, the giant garter snake relies heavily on rice fields and their associated drains and canals in the Sacramento Valley. Giant garter snakes are typically absent from larger rivers because of lack of suitable habitat and emergent vegetative cover, and from wetlands with sand, gravel, or rock substrates. Riparian woodlands typically do not provide suitable habitat because of excessive shade, lack of basking (sunning) sites, and absence of prey populations (USFWS, 2009e).

Within the Secondary Study Area, the giant garter snake is presumed to occur in Butte, Colusa, Glenn, Sacramento, Solano, Sutter and Yolo counties. Suitable giant garter snake habitat exists within portions of the Thermalito Forebay and Afterbay, the Oroville WA, lands subject to rice agriculture adjacent to Thermalito Afterbay, and in isolated patches of backwater habitats along the Feather River (DWR, 2007a). This species is known to occur along the western border of the Yolo Bypass, and was documented in the western Delta in 1998 in the vicinity of Sherman Island. Although giant garter snakes have not been documented within the Sutter Bypass, they are known to occur on the lands immediately adjacent to the bypass and therefore may occur within suitable habitat in the bypass.

The USFWS has proposed recovery units where recovery actions are needed to benefit the giant garter snake. The Sacramento Valley and Mid Valley recovery units, which are located within the Secondary Study Area, include stretches of the Sacramento, Feather, and American rivers, the Yolo and Sutter bypasses, and portions of the Sacramento-San Joaquin Delta (USFWS, 1999a). Although the rivers are not expected to provide suitable habitat for the giant garter snake, some of the oxbows and backwater sloughs, as well as the lands immediately adjacent to the rivers, may provide suitable habitat.

San Francisco Garter Snake

The San Francisco garter snake's *(Thamnophis sirtalis tetrataenia*) preferred habitat is densely vegetated ponds that are located near open hillsides or levees. Hillsides and levees are also used by the snake for basking, feeding, and cover (e.g., rodent burrows) (USFWS, 2002).

Currently, this species is found in only a few localities in San Francisco and San Mateo counties. Within the Secondary Study Area, occurrences of the San Francisco garter snake are known in the vicinity of South San Francisco Bay.

Western Pond Turtle

The western pond turtle ranges throughout California west of the Sierra-Cascade crest, with the exception of the desert regions, at elevations ranging from near sea level to 1430 m (4,690 ft). This turtle is associated with water that is permanent or nearly permanent in a variety of habitats. The western pond turtle uses rocks, floating vegetation, or other partially submerged substrates as basking sites, and seeks cover underwater when disturbed. Females travel on land to seek out suitable nest sites in spring or early summer, laying eggs from March to August (Mayer and Laudenslayer, 1988b).

Western pond turtles can be found throughout the Secondary Study Area in lacustrine, riverine, fresh emergent wetland, montane riparian, and valley foothill riparian habitats.

Birds

Bald Eagle

Wintering bald eagles use a wide variety of habitats including lacustrine, riverine, riparian, emergent wetland, and agricultural croplands. Nesting bald eagles are restricted to habitats associated with large fish-bearing lakes, reservoirs, and rivers with suitable nest trees (Lehman, 1979; Mayer and Laudenslayer, 1988c). The breeding season ranges from February through July.

Bald eagles winter throughout most of the Secondary Study Area in suitable habitat, with extensive winter use occurring at Lake Oroville and Lake Shasta, and regular use occurring along the Feather and Sacramento rivers. A substantial number of bald eagle nests have been documented at Lake Shasta. Nesting bald eagles have also been documented on Lake Oroville and at the Diversion Pool; on the Feather, Klamath, Sacramento, and Trinity rivers; and at Folsom, Lewiston, Trinity, and Whiskeytown lakes (DFG, 2007b; BLM, 2008; DWR, 2007a; Reclamation, 2008; DFG, 2010a).

Bank Swallow

Bank swallows are migratory birds that live in colonies and nest in cavities. Bank swallows use a variety of habitats in and around the Sacramento Valley. Nesting is restricted to riparian, lacustrine, or riverine habitats with vertical cliffs or banks composed of sandy or loamy soils near water (Garrison et al., 1987, Mayer and Laudenslayer, 1988c). Nesting does not normally occur on ephemeral streams or on compacted clay or gravelly substrates. The breeding season ranges from mid-March through July. Foraging activities occur primarily over riparian habitat where insects are taken while flying.

Within the Secondary Study Area, bank swallows are known to occur in many areas, including along the Sacramento River in Shasta, Tehama, Butte, Glenn, Colusa, Sutter and Yolo counties, along the Feather River, in coastal areas of San Francisco County, along the American River in the San Juan Rapids area, and along Seven-Mile slough near Three-Mile Slough in the Sacramento-San Joaquin Delta. Nesting bank swallows have also been observed on lower Clear Creek.

Annual protocol-level bank swallow surveys are conducted on the Sacramento and Feather rivers by DFG, USFWS, and DWR. Surveys on the Sacramento River in 2008 and 2009 documented 65 and 64 active bank swallow colonies, respectively. The 2008 surveys were conducted from the Red Bluff Diversion Dam to Verona, and the 2009 surveys were conducted from Keswick Dam to Verona. Surveys on the Feather River in 2008 and 2009 documented 18 and 20 active bank swallow colonies, respectively, located from downstream of the Thermalito Afterbay outlet to the confluence with the Sacramento River (DFG, 2008b; DFG, 2009e).

California Black Rail

The California black rail is found in the high wetland zones of saline or brackish emergent wetlands associated with heavy growth of pickleweed or with bulrush in association with pickleweed. In freshwater emergent wetlands, it prefers bulrushes, cattails, and saltgrass. This species typically does not occur in low wetland areas with considerable fluctuations in water levels. This species is mostly resident, but may winter in areas where it does not breed (Mayer and Laudenslayer, 1988c).

Within the Secondary Study Area, California black rails occur in San Francisco, San Pablo, and Suisun bays, as well as in portions of the Delta. The majority of breeders occur at San Pablo Bay.

California Clapper Rail

The California clapper rail is a resident in saline, fresh, or brackish emergent wetlands in the vicinity of San Francisco Bay. This species is restricted to emergent wetlands and tidal sloughs with heavy growth of pickleweed and cordgrass, and in brackish wetlands with pickleweed, cordgrass, and bulrush. California clapper rails require shallow water and mudflats for foraging, as well as adjacent higher vegetation for cover during high water (Mayer and Laudenslayer, 1988c).

Within the Secondary Study Area, the California clapper rail is known to occur along San Francisco Bay, San Pablo Bay, and Suisun Bay and Marsh.

Greater Sandhill Crane

Greater sandhill cranes currently breed in Great Basin habitats in northern California where they select open, shallow lacustrine, irrigated pasture, or wetland habitats for nesting. Saline waters are avoided. Winter habitat consists of annual and perennial grasslands, moist croplands (corn, sorghum, barley, and rice), or emergent wetlands (Mayer and Laudenslayer, 1988c).

Within the Secondary Study Area, many greater and lesser sandhill cranes winter in the interior of the Sacramento Valley. The emergent wetlands of the Delta also provide suitable foraging habitat for these species.

Willow Flycatcher

The willow flycatcher prefers montane riparian areas and large wet meadows with abundant willows. They are most numerous where there are extensive thickets of low dense willows on the edge of wet meadows, ponds, or backwaters (Mayer and Laudenslayer, 1988c).

Within the Secondary Study Area, willow flycatchers have been regularly observed foraging along lower Clear Creek during spring and fall migration, but no nesting has been observed in the lower Clear Creek watershed (BLM, 2008). This species has also been observed along the Trinity River corridor (Reclamation, 2009), and may use riparian woodlands during migration along the Upper Sacramento River from the Red Bluff Diversion Dam to Shasta Dam (Reclamation, 2008).

Western Yellow-Billed Cuckoo

The western yellow-billed cuckoo is a migratory species that does not winter in California. Suitable nesting habitat, typically in dense mixed riparian forest habitat, consists of extensive (25 acres or larger) riparian forest with dense understory (willow) near slow moving waters (Mayer and Laudenslayer, 1988c). Walnut orchards adjacent to riparian areas have also been used successfully as nesting habitat (Laymon, 1980).

Within the Secondary Study Area, several small isolated breeding populations occur in suitable habitat along the upper Sacramento River, as well as along the lower Feather River. One individual western yellow-billed cuckoo was observed in lower Clear Creek in 2004, but this species is not believed to nest in that area (DFG, 2008a; Reclamation, 2008; DWR, 2007a; BLM, 2008).

Mammals

Salt-Marsh Harvest Mouse

The salt-marsh harvest mouse (*Reithrodontomys raviventris*) is found only in saline emergent wetland habitat, with a preference for areas of dense pickleweed. This species also requires nearby non-submerged, salt-tolerant vegetation for escape during highest tides (Mayer and Laudenslayer, 1988d).

The salt-marsh harvest mouse is found within the Secondary Study Area in the saline emergent wetlands around San Francisco, San Pablo, and Suisun bays, as well as portions of the Delta (DFG, 2008a; Reclamation, 2006).

14.2.2.4 Commercially or Recreationally Important Wildlife Species

Up to 67 harvest species (43 birds, 23 mammals, and 1 amphibian) may occur in the Secondary Study Area within the 7 natural habitat types, and up to 52 harvest species (31 birds, 20 mammals, and 1 amphibian) may occur in the Sutter and Yolo county portion of the Secondary Study Area within the 3 agricultural habitat types (DFG, 2008a). Examples of harvest bird and mammal species are listed in the Extended Study Area discussion (Section 14.2.1.4).

The Secondary Study Area includes portions of 11 of the State's deer hunting zones (DFG, 2009b). The Oroville WA, as well as the managed wetlands and flooded rice fields of private duck clubs within the Sutter and Yolo bypasses, provide waterfowl hunting opportunities (DWR, 2007a).

14.2.3 Primary Study Area

14.2.3.1 Methodology

Wildlife Habitats and Associated Wildlife

The vegetation types within the proposed Sites Reservoir footprint were delineated by hand on aerial photo overlays, field-verified, and digitized. Vegetation types in other Project facility locations were delineated using ArcView GIS software, aerial photo interpretation, and field verification. A detailed description of survey methods used to map vegetation is provided in Chapter 13 Botanical Resources. Mapped vegetation types were reclassified into WHR habitat types. The WHR System (DFG, 2008a) was then used to identify the potential number of wildlife species that could occur within the habitat types in the Primary Study Area.

A variety of research and field survey methods were used to sample wildlife. Preliminary research included general literature searches, consultation with agency and species experts, aerial photo habitat interpretations, and landowner interviews. In addition, reviews of the CNDDB, WHR System, and the Federal Register of Threatened, Endangered, and Special-Status Species were conducted.

Initial field surveys were conducted within the Primary Study Area from 1998 to 2004 at all Project facility locations, then again in 2010 to 2011 at newly proposed Project facility locations. Amphibian and reptile surveys included night driving, dip-netting, seining, ground searches, and habitat assessment. Avian surveys included line transects and bank swallow, cuckoo, and owl surveys. Mammal surveys included small mammal trapping, mist netting, acoustical surveys, roost searches, track plates, camera stations, spotlighting, general habitat measurements and assessment, and incidental observation. Detailed descriptions of these survey methods are listed in their associated survey progress reports (DFG, 2003a; DFG, 2003b; DWR, 2003).

Special-Status Wildlife Species

A current list of special-status wildlife was generated using the Sacramento USFWS Office's Endangered Species Program website (USFWS, 2009a). The list covered the following U.S. Geological Survey 7.5-minute quadrangle maps (map numbers are provided in parentheses): Leesville (547B), Manor Slough (547A), Lodoga (563C), Sites (563D), Maxwell (562C), Moulton Weir (562D), Rail Canyon (563B), and Logan Ridge (563A). The list includes federal endangered, threatened, and candidate species that may be affected within the Primary Study Area, as well as areas of designated critical habitat. The list was generated prior to initiation of field surveys (September 1997 and October 1998), updated during the development of the progress report (July 2002), and updated again during the preparation of this environmental document (October 2009).

The CNDDB *State and Federally Listed Endangered and Threatened Animals of California* (October 2009) and *Special Animals* (July 2009) lists were also consulted for State-listed wildlife species and species of special concern. Wildlife species listed as federal species of concern, State species of special concern, or State fully protected species were included. Species which were listed at the start of field surveys, but have since been delisted, were not included. Species designated as only BLM or USFS Sensitive Species were not included because the Project features are not proposed to be constructed on USFS or BLM land. In addition, bat species designated as High Priority by the Western Bat Working Group, but not with a State or federal status, were not included.

The CNDDB's Rarefind 3 and Rarefind 4 software were used to document the nearest known locations to the Primary Study Area of threatened or endangered species that were not observed during field surveys. Lack of documentation in the Rarefind database within a county does not imply absence of the species in that county.

During field surveys, the valley elderberry longhorn beetle (VELB) was surveyed according to procedures outlined in the USFWS 1996 report on mitigation guidelines. Subsequent surveys followed the 1999 guidelines. Vernal pool crustaceans were sampled in accordance with the USFWS protocols contained in "Interim Survey Guidelines to Permittees for Recovery Permits pursuant to Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods" (April 19, 1996).

Amphibian and reptile surveys included night driving, dip-netting, seining, ground searches, habitat assessment, consultation with USFWS, and the use of USFWS and DFG's protocol guidelines for red-legged frog and California tiger salamander. Avian surveys included line transects and bank swallow, owl, and yellow-billed cuckoo surveys. Mammal surveys included small mammal trapping, mist netting, acoustical surveys, roost searches, track plates, camera stations, spotlighting, general habitat measurements and assessment, and incidental observation. Detailed descriptions of these survey methods, as well as more detailed species life history accounts, are included in their associated survey progress reports (DFG, 2003a; DFG, 2003b; DWR, 2003).

Commercially or Recreationally Important Wildlife Species

The Primary Study Area provides seasonal and year-round habitat for a variety of commercially or recreationally important wildlife species. The WHR System (DFG, 2008a) was used to generate a list of all harvest (hunted or trapped) species that could occur in Colusa and Glenn counties within the habitat types present in the Primary Study Area.

14.2.3.2 Wildlife Habitats and Associated Wildlife

Eighteen wildlife habitat types were identified within the Primary Study Area. Of those 18 wildlife habitat types, the principal types, based on total acreage within the Primary Study Area, include annual grassland, blue oak woodland, rice, dryland grain and seed crops, irrigated row and field crops, pasture, lacustrine, urban/disturbed, and valley foothill riparian. The total acreage of each habitat type within the Primary Study Area, as well as the percent that each habitat type represents of the total Project acreage, is presented in Table 14-1. Acreage totals reflect baseline conditions[2] and represent the Project alternative that has the largest construction-related on-the-ground disturbance (Alternative C). Acreage totals include the footprint of each Project facility and the defined construction disturbance area for the Delevan Pipeline. The principal habitat types are described below.

Table 14-1
Wildlife Habitat Types within the Primary Study Area

Habitat Type	Acreage	
	Primary Study Area[a]	Percent of Primary Study Area Total
Annual grassland	14,765.5	75.4
Barren[b]	21.6	0.1
Blue oak woodland	1,531.9	7.8
Canal	22.4	0.1
Chamise-redshank chaparral	2.5	0[e]
Deciduous orchard	188.6	1.0
Dryland grain and seed crops	535.9	2.7
Eucalyptus	46.2	0.2
Fresh emergent wetland[c]	18.5	0.1
Irrigated row and field crops	366.1	1.9
Lacustrine[d]	28.8	0.2
Mixed chaparral	2.6	0[e]
Pasture	312.7	1.6
Rice	1,493.7	7.6
Riverine	1.6	0[e]
Urban/disturbed	136.8	0.7
Valley foothill riparian	113.6	0.6
Valley oak woodland	3.5	0[e]
TOTAL	**19,592.0**	**100**

[a]The Primary Study Area includes the proposed Alternative C facility footprints, and the construction disturbance area for the Road Relocations, Delevan Transmission Line, Delevan and TRR pipelines, TRR to Funks Creek Pipeline, Holthouse to T-C Canal Pipeline, and GCID Canal Facilities Modifications. This total does not include acreage occupied by existing facilities, namely Funks Reservoir and the GCID Canal.

[b]Barren habitat includes fallowed agricultural fields.

[c]Fresh Emergent Wetland includes alkaline wetlands.

[d]Lacustrine habitat includes ponds.

[e]Represents less than 0.1 percent of total.

Annual Grassland

Annual grassland habitat occurs mostly on flat plains to rolling foothills and is composed primarily of introduced annual plant species. Perennial species can occur in moist areas, and vernal pools can occur within annual grassland habitat where depressions are underlain by impervious clay or hardpan soils. Grassland composition and structure depends on precipitation and grazing practices (Mayer and Laudenslayer, 1988a).

[2] Agricultural habitat types change from year to year and vary between actively managed and fallowed fields. Additional acreage of natural habitat types have been converted to agricultural habitat types since the time of baseline.

Approximately 75 percent of the Primary Study Area is annual grassland habitat (representing less than one percent of the total acreage of this habitat type found throughout California). Extensive annual grassland habitat occurs at all Project facility locations, except for the Delevan Pipeline Intake/Discharge facilities. Within the grassland areas are livestock ponds, small rock outcrops, and vernal pools and swales. Yellow star thistle infestations are common.

Up to 196 species (116 birds, 51 mammals, 18 reptiles, and 11 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in annual grassland habitat included the Pacific chorus frog, western fence lizard, western rattlesnake (*Crotalus viridis*), western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), American kestrel, turkey vulture (*Cathartes aura*), deer mouse (*Peromyscus maniculatus*), San Joaquin pocket mouse, California ground squirrel, black-tailed jackrabbit, American badger (*Taxidea taxus*), mule deer, and coyote (*Canis latrans*).

Blue Oak Woodland

Blue oak woodland habitat generally has an overstory of scattered trees, with varying densities of blue oaks (*Quercus douglasii*) comprising 85 to 100 percent of the trees present. This habitat includes the interior live oak (*Q. wislizenii)* and the valley oak. Shrubs, such as chamise (*Adenostoma fasciculatum*), buckbrush (*Ceanothus cuneatus*), and whiteleaf manzanita (*Arctostaphylos viscida*), are often present, and the typical understory is composed of an extension of annual grassland vegetation. Blue oaks grow slowly and regeneration is rarely successful on grazed lands (Mayer and Laudenslayer, 1988a).

More than seven percent of the Primary Study Area is blue oak woodland habitat (representing less than one percent of the total acreage of this habitat type found throughout California). Blue oak woodland habitat occurs in varying forms within the Primary Study Area in smaller valleys, on slopes, on ridge tops, and in moderately rocky to well-drained areas. Project facility locations vary widely in the representation of blue oak-dominated woodlands. Woodlands range from sparse stands of large-diameter trees to dense stands of small-diameter trees. Stands include a few snags and logs, as well as brush piles and stumps that are the result of fuel wood harvest activities. Blue oak woodland exists within the proposed Sites Reservoir footprint, along portions of most of the road relocations (excluding the North Road and Eastside Road), and at all of the Recreation Areas, with the exception of Saddle Dam.

Up to 227 species (141 birds, 54 mammals, 19 reptiles, and 13 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in blue oak woodland habitat included the California slender salamander, western fence lizard, southern alligator lizard (*Elgaria multicarinata*), acorn woodpecker (*Melanerpes formicivorus*)), northern flicker (*Colaptes auratus*), brush mouse, California ground squirrel, black-tailed jackrabbit, raccoon, and wild pig.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat includes non-irrigated barley, oats, and wheat. These grain and seed crops are typically planted in the fall and harvested in the spring, often in rotation with irrigated crops or fallowed for a few seasons. Dryland grain and seed crops are usually planted on fertile soils that once supported diverse native habitats, although barley can be grown on poor quality saline or alkaline soils. These monoculture, harvested, and chemically-controlled crops have limited value to most wildlife, but species, such as deer, elk, and pigs, have adapted and can be crop pests (Mayer and Laudenslayer, 1988a).

More than two percent of the Primary Study Area is dryland grain and seed crops (representing less than one percent of the total acreage of this habitat type found throughout California). Dryland grain and seed crops exist within the Primary Study Area mainly within the proposed Sites Reservoir footprint, and in smaller amounts along the Delevan Pipeline, within the footprints of the Terminal Regulating Reservoir (TRR) and Holthouse Reservoir, and along Sulphur Gap Road.

Up to 106 species (54 birds, 42 mammals, 6 reptiles, and 4 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species commonly associated with dryland grain and seed crops include the northern harrier, ring-necked pheasant, red-winged blackbird, and Botta’s pocket gopher.

Irrigated Row and Field Crops

Irrigated row and field crops are described in the Extended Study Area discussion (Section 14.2.1.2). Nearly two percent of the Primary Study Area is irrigated row and field crops (representing less than one percent of the total acreage of this habitat type found throughout California). This crop type is found within the footprint of Holthouse Reservoir, and within the construction disturbance areas of the Delevan Pipeline and Delevan Transmission Line.

Up to 94 species (41 birds, 43 mammals, 6 reptiles, and 4 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species commonly associated with irrigated row and field crops habitat are described in the Extended Study Area discussion (Section 14.2.1.2).

Lacustrine

Lacustrine habitat is described in the Secondary Study Area discussion (Section 14.2.2.2). Approximately one percent of the Primary Study Area is lacustrine habitat[3]. Lacustrine habitat, in the form of human-made ponds, is found in small amounts within the proposed Sites Reservoir footprint and Saddle Dam and Lurline Headwaters recreation areas, as well as along the portions of all road segments and the Delevan Pipeline. The majority of the acreage of lacustrine habitat occurs at the existing Funks Reservoir.

Up to 135 species (103 birds, 17 mammals, 5 reptiles, and 10 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in lacustrine habitat included the mallard, western grebe, great blue heron, and American coot.

Pasture

Pasture habitat is described in the Extended Study Area discussion (Section 14.2.1.2). More than one percent of the Primary Study area is pasture habitat (representing less than one percent of the total acreage of this habitat type found throughout California). Within the Primary Study Area, pasture is found mainly within the proposed Sites Reservoir footprint. Pasture is also found to a lesser extent along the Delevan Pipeline and within the footprint of the TRR.

Up to 72 species (9 birds, 49 mammals, 10 reptiles, and 4 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species commonly associated with pasture habitat are described in the Extended Study Area discussion (Section 14.2.1.2).

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[3] The total acreage of lacustrine habitat throughout California is not available. Therefore, the percentage of total lacustrine habitat that the lacustrine habitat in the Primary Study Area would encompass cannot be determined.

Rice

Rice habitat is described in the Extended Study Area discussion (Section 14.2.1.2). More than seven percent of the Primary Study Area is rice habitat (representing less than one percent of the total acreage of this habitat type found throughout California). Within the Primary Study Area, the Delevan Pipeline route and TRR have substantial rice coverage.

Up to 186 species (133 birds, 33 mammals, 15 reptiles, and 5 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in rice habitat included the great blue heron, great egret, and raccoon.

Urban/Disturbed

Urban/disturbed habitat is described in the Extended Study Area discussion (Section 14.2.1.2). Less than one percent of the Primary Study Area is urban/disturbed habitat (representing less than one percent of the total acreage of this habitat type found throughout California). Urban/disturbed habitat exists within the Primary Study Area in the form of residences, outbuildings, and stockyards. These sites may include non-native ornamental varieties of plants, or may support very little or no vegetation. Urban areas are located within most of the proposed Project facility locations, with the exception of the Delevan Pipeline Intake/Discharge facilities, Holthouse Reservoir, Funks Reservoir, and the Recreation Areas. Up to 192 species (147 birds, 34 mammals, 7 reptiles, and 4 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in this habitat type and associated with structures included the house sparrow, yellow-billed magpie, and pallid bat (*Antrozous pallidus*).

Valley Foothill Riparian

Valley foothill riparian habitat is described in the Secondary Study Area discussion (Section 14.2.2.2). Less than one percent of the Primary Study Area is valley foothill riparian habitat (representing less than one percent of the total acreage of this habitat type found throughout California).Valley foothill riparian habitat was mapped in areas where no single woody species dominated the riparian canopy, and where streamside vegetation was dominated by the valley oak. Mexican elderberry (*Sambucus mexicana*) occurs within or adjacent to riparian areas, as individuals or in small stands. Streams within this habitat type are intermittent, and streambeds are typically dry or contain only isolated pools of water during summer.

Disturbed valley foothill riparian is scattered in small patches throughout the proposed Sites Reservoir footprint, at Funks and Holthouse reservoirs, at the Delevan Pipeline Intake/Discharge facilities, and is found in very small amounts along portions of most roads (excluding the saddle dam and recreation area access roads) and the Delevan Pipeline route. Up to 267 species (176 birds, 58 mammals, 19 reptiles, and 14 amphibians) may be found within this habitat type within the Primary Study Area (DFG, 2008a). Wildlife species frequently observed during field surveys in this habitat type included the bullfrog, western toad, western fence lizard, common garter snake, killdeer, raccoon, gray fox (*Urocyon cinereoargenteus*), coyote, and mule deer.

14.2.3.3 Wildlife Habitats at the Proposed Project/Proposed Action Facility Locations

The wildlife habitat types at each Project facility location are presented in Table 14-2.

Table 14-2
Wildlife Habitat Types at each Project Facility Location

Project facility	Annual Grassland	Barren	Blue oak Woodland	Canal	Chamise-redshank Chaparral	Deciduous Orchard	Dryland grain and Seed Crops	Eucalyptus	Fresh Emergent Wetland	Irrigated row and Field Crops	Lacustrine	Mixed Chaparral	Pasture	Rice	Riverine	Urban/Disturbed	Valley Foothill Riparian	Valley Oak Woodland
Sites Reservoir and Dams	x		x				x				x		x			x	X	x
Recreation Areas	x		x		x						x							
Road Relocations and South Bridge	x		x	x	x		x				x	x				x	X	
Sites Reservoir Inlet / Outlet Structure and Sites Pumping / Generating Plant	x										x					x	X	
Tunnel from Sites Pumping / Generating Plant to Sites Inlet / Outlet Structure	x																	
Sites Electrical Switchyard	x																	
Field Office Maintenance Yard	x																	
Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard	x			x			x			x	x					x	X	
GCID Canal Facilities Modifications				x												x		
GCID Canal Connection to the TRR				x			x											
Terminal Regulating Reservoir							x						x	x		x		
TRR Pumping / Generating Plant and TRR Electrical Switchyard														x				
TRR Pipeline and TRR Pipeline Road				x			x						x	x				
Delevan Pipeline and Delevan Pipeline Electrical Switchyard		x		x		x	x	x	x	x	x		x	x		x		
Delevan Transmission Line	x	x		x		x	x	x	x	x	x		x	x		x	X	
Delevan Pipeline Intake / Discharge Facilities				x		x									x	x	X	
Project Buffer	x	x	x	x	x	x	x			x	x		x	x		x	X	x

14.2.3.4 Special-Status Wildlife Species – Threatened, Endangered, or Candidate Species

Fifteen threatened, endangered, or candidate wildlife species may occur within the Primary Study Area (Table 14-3) (USFWS, 2009a; DFG, 2009a). Of those 15 species, field surveys, consultations, and post-survey observations resulted in the documentation of five species. Species accounts for the

15 species are provided below. No critical habitat for any species has been designated within the Primary Study Area.

Table 14-3
State-and Federally-Listed Terrestrial Wildlife Species that may Occur in the Primary Study Area

Species	Scientific Name	Status[a]	Habitat Association[b]
Invertebrates			
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	AGS
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	AGS
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE	AGS
Valley elderberry longhorn beetle[c]	*Desmocerus californicus dimorphus*	FT	VRI
Reptiles and Amphibians			
California red-legged frog	*Rana aurora draytonii*	FT	FEW, AGS, BOW, BOP
California tiger salamander	*Ambystoma californiense*	FT, ST[e]	AGS, VOW
Giant garter snake[d]	*Thamnophis gigas*	FT, ST	FEW, RIC, VRI
Birds			
Bald eagle[c]	*Haliaeetus leucocephalus*	D, SE	LAC, RIV, VRI
Bank swallow	*Riparia*	ST	BAR, RIV
Northern spotted owl	*Strix occidentalis caurina*	FT	DFR, RDW, MHC
Greater sandhill crane[c]	*Grus canadensis tabida*	ST	FEW, WTM, PAS
Swainson's hawk[c]	*Buteo swansoni*	ST	AGS, BOW, VRI, VOW
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FC, SE	DOR, VRI
Willow flycatcher	*Empidonax traillii*	SE	VRI, MRI, WTM
Mammals			
Pacific fisher	*Martes pennanti pacifica*	CST or CSE	MHC, SMC

[a]Status Key

FE = Federal Endangered
FT = Federal Threatened
FC = Federal Candidate
D = Delisted
SE = State Endangered
ST = State Threatened
CSE = Candidate State Endangered
CST = Candidate State Threatened

[b]Habitat Key

AGS = Annual grassland
BAR = Barren
BOP = Blue oak-foothill pine
BOW = Blue oak woodland
DFR = Douglas Fir
FEW = Freshwater emergent wetland
LAC = Lacustrine
MHC = Mixed hardwood conifer
RDW = Redwood
RIC = Rice
RIV = Riverine
SMC = Sierran Mixed Conifer
VOW = Valley oak woodland
VRI = Valley/foothill riparian
WTM = Wet meadow

[c]Species documented during field surveys.
[d]Species confirmed as present within Primary Study Area by USFWS.
[e]Status changed from CSE to ST on 03-03-10.

Invertebrates

Conservancy Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp

Fairy and tadpole shrimps are restricted to temporary pools in California. Typical habitat includes vernal pools, ponded areas within vernal swales, rock outcrop ephemeral pools, playas, alkali flats, and salt lakes (Eng et al., 1990). Fairy shrimp are typically absent from permanent water bodies. These shrimp are not abundant in ponds that contain large invertebrate predators, and are rarely found in bodies of water that contain carnivorous fish (Smith, 2001).

The federally endangered Conservancy shrimp is known to exist in a pool located within ten miles of the Primary Study Area. The federally threatened vernal pool fairy shrimp and the federally endangered vernal pool tadpole shrimp are widespread throughout the Central Valley, and are reported to occur within Glenn and Colusa counties.

The quality of potential habitat found within the proposed reservoir footprint is marginal. Many of the pools do not remain ponded for entire seasons, and some potential habitats do not pond at all. The pools are dominated by non-native vegetative species and are heavily affected by cattle ranching. The soils are alkaline and are unsuitable for many species (Eng et al., 1990, Eriksen and Belk, 1999). Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp were not identified within the Primary Study Area during protocol-level field surveys.

Valley Elderberry Longhorn Beetle

The federally threatened valley elderberry longhorn beetle (VELB) is endemic to riparian systems along the margins of rivers and streams, occasional seeps, and in adjacent grassy savannas in the Sacramento and San Joaquin valleys. VELB feeds on two species of elderberry shrubs, and the adult females deposit eggs in the crevices of the bark of these plants. Emergence holes are typically observed in shoots or branches of mature healthy plants (Barr, 1991).

The elderberry shrubs within the Primary Study Area are individuals with multiple trunks and range from unhealthy stressed plants to occasional large healthy plants. During protocol-level field surveys, VELB emergence holes were found on 18 (3 percent) of 672 elderberry stems surveyed within the proposed Sites Reservoir footprint, primarily along Grapevine and Antelope creeks. Elderberry shrubs were also surveyed east of the proposed reservoir along Funks Creek, along a previously proposed road route west of the reservoir footprint, and at the proposed Delevan Pipeline Intake/Discharge facilities, but no emergence holes were observed.

Amphibians

California Red-Legged Frog

The federally threatened California red-legged frog is described in the Secondary Study Area discussion (Section 14.3.2.3). The nearest known locations of red-legged frogs to the Primary Study Area are in Butte and Tehama counties, typically in meadow or grassland ponds that are surrounded by pine forest or blue-oak woodland. All water sources within the primary study area are considered suitable, although most ponds contain bullfrogs. The California red-legged frog was not observed within the Primary Study Area during protocol-level field surveys.

California Tiger Salamander

The federally- and State-threatened California tiger salamander is most commonly found in annual grassland habitat, but can also occur in the understory of hardwood habitats. The adults spend most of the year underground, inhabiting the burrows of ground squirrels, gophers, and badgers. This species lays eggs in vernal pools or other temporary ponds that contain submerged and/or emergent vegetation, and will use permanent human-made ponds if predatory fish are absent (Mayer and Laudenslayer, 1988b; Stebbins, 1985).

The nearest known locations of tiger salamanders to the Primary Study Area are in Sacramento and Yolo counties, typically in ponds, vernal pools, or slow-moving creeks surrounded by grassland or oak savanna. The USFWS list does not include this species as potentially occurring in the Primary Study

Area, and Colusa County appears to be outside of its current range. However, the WHR System lists this species as potentially occurring in Colusa County within the habitat types of the Primary Study Area. The California tiger salamander was not observed during protocol-level field surveys within the proposed Sites Reservoir Inundation Area, although potentially suitable habitat exists within the Primary Study Area.

Reptiles

Giant Garter Snake

The federally- and State-threatened giant garter snake is described in the Secondary Study Area discussion (Section 14.2.2.3). Consultation with the USFWS confirmed that giant garter snakes occur within the Primary Study Area, mainly within rice habitat found along portions of Delevan Pipeline.

Birds

Bald Eagle

The federally delisted and State-endangered bald eagle is described in the Secondary Study Area discussion (Section 14.2.2.3). Sporadic winter use by adult and immature bald eagles in the Primary Study Area has been documented. During initial field surveys, no nests, adult pairs, or nesting behavior were observed at any proposed Project facility location. However, during subsequent visits to the Primary Study Area a nesting pair of bald eagles was observed at the proposed Golden Gate Dam site. This pair successfully reproduced in 2008, 2009, 2010, 2011, and 2012.

Bank Swallow

The State-threatened bank swallow is described in the Secondary Study Area discussion (Section 14.2.2.3). The nearest known locations of nesting bank swallows to the Primary Study Area are in Glenn and Colusa counties along the Sacramento River.

The incised channels of virtually all of the streams within the Primary Study Area contain some unvegetated vertical banks, and all streams are ephemeral with only limited ponded water present by June 15 during most years. Sandy or loamy soils are generally absent. Bank swallow surveys along the streams within the Primary Study Area failed to detect any sign of nesting bank swallows.

The Delevan Pipeline Intake/Discharge facilities are proposed to be located on the Sacramento River at River Mile (RM) 158.5 on the right bank. The proposed facility location is geologically stable, with geologic control upstream and downstream along the levee (refer to Chapter 8 Fluvial Geomorphology and Riparian Habitat for a detailed description of this location). Annual bank swallow surveys are conducted along the Sacramento River in June by USFWS, DFG, and DWR personnel. Bank swallow survey data for most years between 2000 and 2009 showing the nearest colony locations to the proposed intake/discharge facility location, as well as the number of burrows in each colony, are presented in Table 14-4.

Table 14-4
Nearest Bank Swallow Colony Locations to the Delevan Pipeline Intake/Discharge Facilities

Bank Swallow Survey Year	Locations Upstream of Intake/Discharge Facilities		Locations Downstream of Intake/Discharge Facilities	
	Nearest River Mile (Side of Bank)	Estimated Number of Burrows in Colony	Nearest River Mile (Side of Bank)	Estimated Number of Burrows in Colony
2009	161.6 (L)	80	158.1 (L)	103
2008	161.4 (L)	32	157.0 (L)	160
2007	162.6 (L)	250	158.4 (R)	10
2006*				
2005	162.0 (R)	280	157.0 (L)	910
2004	159.0 (R)	100	156.8 (L)	370
2003	162.5 (R)	170	157.0 (L)	50
2002*				
2001	162.1 (R)	240	156.6 (L)	1270
2000	162.7 (L)	280	157.3 (L)	260

*Surveys were not conducted in 2002, and the stretch of the river near the proposed Delevan Pipeline Intake/Discharge facilities was not surveyed in 2006.

Northern Spotted Owl

The federally threatened northern spotted owl occurs throughout the mountainous portions of northwest California, including the extreme western portions of Glenn and Colusa counties. Suitable nesting habitat includes extensive stands (100 to 600 acres) of dense, multilayered, mature or old growth coniferous forest. Although some downslope movement during winter has been observed, little or no use of low-elevation grassland or open oak habitat has been observed in northern California (Mayer and Laudenslayer, 1988c). Suitable nesting and foraging habitat for the northern spotted owl is absent in the vicinity of the Primary Study Area.

Greater Sandhill Crane

The State-threatened greater sandhill crane is described in the Secondary Study Area discussion (Section 14.3.2.3). Within the Primary Study Area, wintering sandhill cranes (possibly greater sandhill cranes) were observed along Sacramento Valley floor habitats, including the Delevan Pipeline and the valley portion of Sulphur Gap Road.

Swainson's Hawk

The State-threatened Swainson's hawk is a migratory raptor present within the Sacramento Valley during the breeding season (March through September). Swainson's hawks use desert, grassland, and cropland where scattered large individual trees or small groves of large trees are present. This species forages primarily over irrigated pasture or croplands. Approximately 80 percent of the estimated statewide population occurs in the Central Valley (DFG, 1993).

Suitable nesting and foraging habitat is present within portions of the Primary Study Area. Foraging Swainson's hawks were observed on the Sacramento Valley floor adjacent to the Sites Reservoir footprint, as well as along the Delevan Pipeline and valley portion of Sulphur Gap Road.

Western Yellow-Billed Cuckoo

The federal candidate and State-endangered western yellow-billed cuckoo is described in the Secondary Study Area discussion (Section 14.2.2.3). Suitable nesting habitat within the Primary Study Area is associated with portions of the Delevan Pipeline and the Delevan Pipeline Intake/Discharge facilities. The mature riparian habitat and adjacent walnut orchards in this area were surveyed intensively for cuckoos during the breeding season, but none were detected during Project surveys.

In 2010, the Point Reyes Bird Observatory, in coordination with USFWS and DFG, conducted yellow-billed cuckoo surveys along the Sacramento River from Red Bluff to Colusa. A total of 18 individual cuckoos were detected ranging from RM 157 to RM 240. The detection locations nearest to the Primary Study Area included one detection at Princeton South (RM 163 - DFG land) and one detection at Moulton Island (RM 157 - private land). Both locations are within Colusa County (Dettling and Howell, 2011).

Willow Flycatcher

The State-endangered willow flycatcher is described in the Secondary Study Area discussion (Section 14.2.2.3). Migrating willow flycatchers are infrequently observed in Glenn or Colusa counties. Willow flycatchers are no longer present as a nesting species within the Central Valley (Remsen, 1978).

The nearest known locations to the Primary Study Area of the willow flycatcher are in Colusa (1973) and Tehama (2009) counties. No willow flycatchers were detected during field surveys within the Primary Study Area, and no suitable willow flycatcher habitat was observed.

Mammals

Pacific Fisher

The Pacific fisher is listed as a State Species of Special Concern and as of 2011 is a candidate for federal protection. This species is known to occur at high elevations in extreme western Glenn and Colusa counties. Fisher habitat includes large areas of mature dense coniferous forests and deciduous-riparian habitat with high percent canopy closures (Mayer and Laudenslayer, 1988d). Coniferous and hardwood forests usually provide these habitat requirements. The fisher also prefers forests with hollow trees, rock crevices, slash piles, and porcupine dens. These habitat features provide suitable denning sites.

Following USFS guidelines for fisher survey methods (Zielinski and Kucera, 1995), field crews determined that suitable fisher habitat is not present within the Primary Study Area. However, track plate and camera station sampling were conducted in areas of marginal habitat that occur only sporadically within the Primary Study Area. These efforts failed to detect fishers.

14.2.3.5 Species of Concern and Fully Protected Species

Forty-five federal and/or State terrestrial wildlife species of special concern may occur within the Primary Study Area. Field surveys resulted in the documentation of 28 of these species (Table 14-5). Life history accounts for these species are provided below.

Table 14-5
Terrestrial Wildlife Species of Special Concern that may Occur in the Primary Study Area

Common Name	Scientific Name	Status[a]	Habitat Association[b]
Amphibians			
Foothill yellow-legged frog[c]	*Rana boylii*	SC	VRI
Western spadefoot[c]	*Spea hammondii*	SC	AGS, BOW
Reptiles			
Western pond turtle[c]	*Actinemys marmorata*	SC	VRI
Birds			
American peregrine falcon	*Falco peregrinus anatum*	FSC, SFP	AGS, BOW, BOP, VOW
American white pelican[c]	*Pelecanus erythrorhyncos*	SC	LAC
Barrow's goldeneye	*Bucephala islandica*	SC	LAC, RIV
Bell's sage sparrow[c]	*Amphispiza belli*	FSC	CRC, MCH
Black swift	*Cypseloides niger*	FSC, SC	VOW, BOW, BOP
Black tern[c]	*Chlidonias niger*	SC	LAC, FEW, IGR, AGS
Burrowing owl[c]	*Athene cunicularia*	FSC, SC	AGS
Caspian tern[c]	*Hydroprogne caspia*	FSC	LAC, BAR
Common loon[c]	*Gavia immer*	SC	LAC
Ferruginous hawk[c]	*Buteo regalis*	FSC	AGS, FEW, PAS
Golden eagle[c]	*Aquila chrysaetos*	FSC, SFP	AGS, BOW, FEW
Lawrence's goldfinch[c]	*Carduelis lawrencei*	FSC	BOW
Least bittern	*Ixobrychius exilis*	SC	FEW
Lesser sandhill crane[c]	*Grus canadensis*	SC	FEW, WTM, PAS
Lewis' woodpecker[c]	*Melanerpes lewis*	FSC	VOW
Loggerhead shrike[c]	*Lanius ludovicianus*	FSC, SC	AGS
Long-billed curlew[c]	*Numenius americanus*	FSC	AGS, IRH
Long-eared owl[c]	*Asio otus*	SC	VRI, AGS, BOW
Mountain plover	*Charadrius montanus*	FSC, SC	AGS, BAR, IRF, IRH
Northern goshawk	*Accipiter gentilis*	SC	MHC, JPN, PPN
Northern harrier[c]	*Circus cyaneus*	SC	AGS, FEW, IGR, IRH
Olive-sided flycatcher	*Contopus cooperi*	FSC, SC	MHC, JPN
Prairie falcon[c]	*Falco mexicanus*	FSC	AGS, BOW, BOP, VOW
Purple martin	*Progne subis*	SC	VRI, BOW, MCH
Redhead[c]	*Aythya americana*	SC	FEW, LAC
Rufous hummingbird	*Selasphorus rufus*	FSC	BOW, VOW
Short-eared owl[c]	*Asio flammeus*	SC	AGS, FEW, IGR
Tri-colored blackbird[c]	*Agelaius tricolor*	FSC, SC	AGS, FEW
Tule greater white-fronted goose	*Anser albifrons elgasi*	SC	AGS, FEW, WTM, IGR
Vaux's swift	*Chaetura vauxi*	SC	VRI, LAC
Western snowy plover	*Charadrius alexandrinus nivosus*	FSC, SC	LAC
White-tailed kite[c]	*Elanus leucurus*	SFP	BOW, FEW, AGS, IRH
Yellow-breasted chat	*Icteria virens*	SC	VRI

Table 14-5
Terrestrial Wildlife Species of Special Concern that may Occur in the Primary Study Area

Common Name	Scientific Name	Status[a]	Habitat Association[b]
Yellow-headed blackbird[c]	*Xanthocephalus xanthocephalus*	SC	FEW, WTM
Yellow warbler[c]	*Dendroica petechia brewsteri*	SC	VRI
Mammals			
American badger[c]	*Taxidea taxus*	SC	AGS, BOW, VOW
Pallid bat[c]	*Antrozous pallidus*	SC	AGS, BOW, BOP, VOW
Spotted bat	*Euderma maculatum*	SC	BOP
Townsend's big-eared bat	*Corynorhinus townsendii*	SC	BOW, BOP, VOW
Western mastiff bat	*Eumops perotis californicus*	SC	BOW, BOP, VOW
Western red bat[c]	*Lasiurus blossevillii*	SC	VRI, VOW, BOW

[a]Status Key

FSC = Federal species of concern
SC = State species of special concern
SFP = State fully protected species

[b]Habitat Key

AGS = Annual grassland
BAR = Barren
BOP = Blue oak-foothill pine
BOW = Blue oak woodland
CRC = Chamise-redshank chaparral
FEW = Freshwater emergent wetland
GR = Irrigated grain and seed crops
IRH = Irrigated hayfield
JPN = Jeffrey pine
LAC = Lacustrine
MCH = Mixed chaparral
MHC = Mixed hardwood conifer
PAS = Pasture
PPN = Ponderosa pine
RIV = Riverine
VOW = Valley oak woodland
VRI = Valley/foothill riparian
WTM = Wet meadow

[c]Species documented during field surveys.

Amphibians

Foothill Yellow-Legged Frog

The foothill yellow-legged frog is described in the Secondary Study Area discussion (Section 14.2.2.3). This species is known to occur in southwest and western Colusa County. Although potentially suitable habitat exists, foothill yellow-legged frogs were not observed during extensive field surveys in the Primary Study Area.

Western Spadefoot

The western spadefoot is a toad that ranges throughout the Central Valley and foothills at elevations ranging from near sea level to 1359 m (4,460 ft). This toad is typically found in grasslands with shallow temporary pools, but some populations survive in orchards or vineyards. The western spadefoot spends most of the year in underground burrows. Breeding and egg-laying occurs during winter rains when temporary pools are formed. Eggs are attached to small submerged rocks or plants. Adults move above ground when the rains start, and normally end breeding activities by the end of March. Juveniles leave the breeding ponds in late spring. Adults tend to avoid predation in their underground burrows, but tadpoles are preyed upon by wading birds and some mammals, such as raccoons (Mayer and Laudenslayer, 1988b).

Within the Primary Study Area, one western spadefoot toad was observed during field surveys in grassland habitat along a formerly proposed road route. Although the location is no longer included in the Primary Study Area, it is adjacent to the southern portion of the proposed Sites Reservoir footprint, where similar suitable habitat exists.

Reptiles

Western Pond Turtle

The western pond turtle is described in the Secondary Study Area discussion (Section 14.2.2.3). Within the Primary Study Area, western pond turtles were observed during field surveys in riparian areas and at ponds along a canal within the Delevan Pipeline route, near Funks Reservoir, within the proposed Sites Reservoir footprint, and at the Sites Dam site.

Birds

American Peregrine Falcon

The peregrine falcon is a very uncommon nesting species within the northern Coast Range. This species generally selects high cliffs near lakes, rivers, or wetlands for nesting. Human-made structures, including tall buildings or bridges, have also been used in California for nesting (Jurek, 1989). During winter, peregrines use a wide variety of habitats including agricultural croplands and annual grasslands for foraging.

The nearest known nesting locations of peregrine falcons to the Primary Study Area are in Butte and Tehama counties, typically on volcanic rock or limestone cliffs surrounded by mixed hardwood conifer habitat. No peregrine falcons were observed within the Primary Study Area during field surveys, and no potentially suitable cliff nest sites exist at any proposed Project facility location.

American White Pelican

Habitat for the American white pelican includes rivers, natural lakes, reservoirs, and larger farm ponds containing fish. Historically, white pelicans nested on large lakes throughout California (Grinnell and Miller, 1944). This species may travel long distances between forage and resting areas. These pelicans are gregarious, and flocks can contain large numbers of individuals.

No pelicans were observed within the proposed Sites Reservoir footprint. Suitable habitat is generally lacking except on the larger farm ponds. Small groups of pelicans were observed on Funks Reservoir during winter and fall. Small numbers of pelicans were observed year round along the proposed Delevan Pipeline route. Most observations of habitat use along this route occurred at the Sacramento River or near the Delevan National Wildlife Refuge (NWR).

Barrow's Goldeneye

Barrow's goldeneye is an uncommon winter visitor to California. No breeding by this secondary cavity nester has been documented within California for many years. Nesting habitat is near alkaline lakes or slow moving rivers with abundant submerged aquatic vegetation and open water. Wintering habitats are riverine and lacustrine waters with rocky bottoms (Mayer and Laudenslayer, 1988c).

No Barrow's goldeneye has been observed within the Primary Study Area. However, a landowner within the proposed Sites Reservoir footprint reported the presence of a single Barrow's goldeneye within an ephemeral stock pond during winter 1998. This report was not confirmed. No suitable nesting habitat currently exists within the Primary Study Area. Potentially suitable wintering habitat is present at Funks Reservoir and along portions of the proposed Delevan Pipeline route.

Bell's Sage Sparrow

The Bell's sage sparrow is a subspecies of the common sage sparrow. This species occurs year round in western Glenn and Colusa counties where it frequents dense chaparral stands dominated by chamise

(Mayer and Laudenslayer, 1988c). Sage sparrows are absent from the proposed Sites Reservoir footprint. However, a sage sparrow was observed in suitable chaparral habitat along a formerly proposed road route, which is adjacent to the southern portion of the proposed Sites Reservoir footprint. Similar chaparral habitat occurs within or adjacent to several of the Recreation Areas.

Black Swift

The black swift is a migratory species that has very specific habitat requirements for nesting. This species nests on cliffs and frequently occurs in moist microhabitats including behind or adjacent to waterfalls (Mayer and Laudenslayer, 1988c).

The nearest occurrences of black swifts to the Primary Study Area are generally restricted to the eastern edge of Tehama County in the Sierra Nevada. No black swifts were detected during the field surveys, and potentially suitable nesting habitat is absent from the Primary Study Area.

Black Tern

The black tern is a migratory species that occurs in the Central Valley portion of Glenn and Colusa counties. Black terns use lakes, ponds, rivers, wetlands, moist grassland, and agricultural habitats. It is unknown if this species currently breeds within the Sacramento Valley (Mayer and Laudenslayer, 1988c).

No black tern habitat use was observed within the proposed Sites Reservoir footprint. The proposed Delevan Pipeline route was the only Project feature where black terns were observed, with most use associated with foraging birds over flooded rice fields. No black tern use was observed at Funks Reservoir, which provides potentially suitable foraging habitat.

Burrowing Owl

The western burrowing owl is a semi-colonial year-round resident that uses grassland habitats and a variety of early successional stages of open shrub and forest vegetative types where suitable burrows and perches are present. The burrowing owl uses old burrows of ground squirrels or other small mammals, or may dig its own burrow in soft soil, for roosting and nesting cover (Mayer and Laudenslayer, 1988c).

Small scattered groups of burrowing owls were detected within the proposed Sites Reservoir footprint during diurnal avian line transect sampling. Most of these observations were in upland settings near the grassland/blue oak habitat edge. However, a few individual sightings were made in open grassland habitat along stream channels. Sampling with pre-recorded calls was useful for determining the presence of burrowing owls. Responses were received at 42 percent of the call locations within the proposed Sites Reservoir footprint, indicating wide distribution at this location. Burrowing owls were also detected during winter and fall along a formerly proposed road route, which is adjacent to Road 69 and the North Road.

Caspian Tern

The Caspian tern is common to very common along the California coast and at scattered locations inland from April through early August. This species winters in Southern California, and nests in colonies in the San Francisco, San Pablo, Humboldt, and San Diego bays. The Caspian tern feeds primarily on small fish in freshwater lakes, estuaries, and salt ponds (Mayer and Laudenslayer, 1988c).

Within the primary study area, Caspian terns were observed along the Delevan Pipeline route. Potentially suitable foraging habitat exists at Funks Reservoir.

Common Loon

The common loon has an inland distribution that is extremely irregular and associated with large natural lakes and some reservoirs. This uncommon wintering species requires deep freshwater lakes with adequate small food fish (Mayer and Laudenslayer, 1988c).

Common loons were observed only at Funks Reservoir and only during spring and fall migration. Individual loons were observed on Funks Reservoir on two occasions. Funks Reservoir represents the only lacustrine habitat within the Primary Study Area, excluding some of the larger farm ponds.

Ferruginous Hawk

The ferruginous hawk is a relatively uncommon winter migrant. Ferruginous hawks are present in the Sacramento Valley from September through mid-April and use large tracts of open grasslands for winter foraging habitat (Mayer and Laudenslayer, 1988c).

Within the Primary Study Area, sporadic individual sightings of wintering ferruginous hawks were made within the proposed Sites Reservoir footprint.

Golden Eagle

The golden eagle nests throughout northern California, with the exception of the dense forests along the North Coast. Extensive wintering use of the Sacramento Valley can occur. This species forages in open habitats including grasslands, savannas, and early successional stages of open shrub and tree habitats (Mayer and Laudenslayer, 1988c).

The golden eagle is one of the most common large raptors year round within the Primary Study Area. Several active golden eagle nests were identified around the proposed Sites Reservoir rim areas, including nesting activity in, or near, three of the five proposed Recreation Areas. Golden eagle densities varied, with the highest density recorded during the winter. The highest densities associated with any proposed Project features were spring and fall densities on a formerly proposed road route, which is southeast of the proposed Sites Reservoir footprint. Along the proposed Delevan Pipeline route, golden eagles were recorded only during winter and only along the western end of the route where agricultural croplands meet the foothills.

Lawrence's Goldfinch

The Lawrence's goldfinch primarily occurs in Glenn and Colusa counties during the breeding season (March through September). Limited wintering use has been observed. This species breeds and forages in open oak or shrub habitats near water (Mayer and Laudenslayer, 1988c).

Lawrence's goldfinches were observed only sporadically within the Primary Study Area, although suitable nesting habitat exists. Observations were made in the reservoir footprint, at Funks Reservoir, and along a formerly proposed road route, which is southwest of the proposed Sites Reservoir footprint. Lawrence's goldfinches were frequently encountered in mixed flocks with other goldfinches. Only rarely were individuals of this species encountered, even during the breeding season.

Least Bittern

The least bittern occurs along the Sacramento River in eastern Glenn and Colusa counties from April through September. Least bitterns use dense emergent wetland vegetation for reproduction and foraging (Mayer and Laudenslayer, 1988c).

No least bitterns were detected within the Primary Study Area. Adequate amounts of suitable habitat for this reclusive species are present along portions of the proposed Delevan Pipeline route. Some of the farm ponds and roadside ditches within the proposed Sites Reservoir footprint have a limited amount of emergent vegetation present. However, adequate amounts of potentially suitable habitat for this species are absent from all proposed Project features.

Lesser Sandhill Crane

Lesser sandhill cranes do not breed in California, but winter mainly in the Central Valley, including areas of Glenn and Colusa counties west of the Sacramento River. Winter habitat consists of annual and perennial grasslands, moist croplands (corn, sorghum, barley, and rice), or emergent wetlands (Mayer and Laudenslayer, 1988c).

Within the Primary Study Area, wintering sandhill cranes (possibly lesser sandhill cranes) were observed along Sacramento Valley floor habitats, including the Delevan Pipeline route and the valley portion of Sulphur Gap Road.

Lewis' Woodpecker

The Lewis' woodpecker was not identified as a special- status species when field surveys began. Lewis's woodpecker occurs year round in western Glenn and Colusa counties. Preferred habitat includes open oak and conifer habitats that have snags with cavities (Mayer and Laudenslayer, 1988c).

This woodpecker occurred infrequently within the proposed Sites Reservoir footprint during spring and fall, as well as along the North and Sulphur Gap roads. Suitable habitat is generally lacking in the northern portion of the proposed reservoir area. No summer use was recorded.

Loggerhead Shrike

The loggerhead shrike occurs in open habitats with infrequent perch sites (trees, shrubs, fences, and power lines). Loggerhead shrikes forage over open sparse, low herbaceous cover. This territorial species occurs yearlong in Glenn and Colusa counties with resident and migrants present during the winter (Mayer and Laudenslayer, 1988c).

The loggerhead shrike is one of the more common and widespread avian species in grassland habitats within the Primary Study Area. This shrike's abundance appears to decrease rapidly with increasing tree density. Loggerhead shrike densities varied within the proposed Sites Reservoir footprint.

Long-Billed Curlew

The long-billed curlew winters in the Sacramento Valley. This large shorebird uses a variety of open habitats in the Sacramento Valley during the winter including croplands, mudflats, flooded areas, and open grasslands (Mayer and Laudenslayer, 1988c).

Long-billed curlews were present sporadically within the proposed Sites Reservoir footprint throughout the winter and spring. Large flocks were occasionally encountered foraging in the grassland habitats when the soils were at or near saturation. Extensive use of vernal pool areas was also observed. All curlew observations at Funks Reservoir were of birds foraging in exposed mudflats. The grasslands surrounding Funks Reservoir are ungrazed, relatively tall, dense, and apparently unsuitable for curlew foraging habitat. Curlew use along the proposed Delevan Pipeline route occurred in flooded rice fields and within annual grassland habitats along the westernmost end of the proposed route. The long-billed curlew was also observed along Sulphur Gap Road, as well as within the Saddle Dam Recreation Area.

Long-Eared Owl

The long-eared owl occurs year round in valley and foothill locations in Glenn and Colusa counties. Preferred nesting habitat is reported as dense riparian and live oak stands near open areas or forest/grassland edges (Mayer and Laudenslayer, 1988c).

Long-eared owls were observed regularly at a single location along the proposed Delevan Pipeline route during summer. Although no long-eared owls were detected along diurnal transect routes, nocturnal censusing with prerecorded taped calls indicate that long-eared owls are common along the blue oak/grassland edge habitats within the Primary Study Area. Long-eared owl responses were obtained at 54 percent of the half-mile segments sampled within the proposed Sites Reservoir footprint. This species appears to be less common in extensive open grassland habitats. However, an active nesting pair of long-eared owls was observed 0.5 mile northeast of the proposed Sites Reservoir footprint in an isolated cottonwood tree in grassland habitat.

Mountain Plover

The mountain plover is a winter resident in California, typically found on short open grasslands and plowed fields with little vegetation (Mayer and Laudenslayer, 1988c). This species is known to occur in southeast Colusa County.

No mountain plovers were observed within the Primary Study Area, but potentially suitable habitat exists at many of the proposed Project facility locations.

Northern Goshawk

The northern goshawk is an uncommon year-round resident that frequents mid- to high-elevation mature dense coniferous forests for reproduction. Some limited winter use of low-elevation foothill riparian habitat has been documented (Mayer and Laudenslayer, 1988c). This species is known from the higher elevations of Glenn and Butte counties.

No goshawks were encountered during avian transect sampling within the Primary Study Area. Further, potentially suitable nesting habitat is not present at this low elevation.

Northern Harrier

The northern harrier is a common year-round resident that uses a variety of open habitats including meadows, wetlands, and annual and perennial grasslands. This species seldom uses forest or woodland habitats, although some forest/grassland edge habitats are used. Agricultural habitats that mimic tall dense grasslands or freshwater emergent vegetation types are also used as foraging habitats (Mayer and Laudenslayer, 1988c).

Northern harriers were observed at all Project features. Northern harriers are a relatively common species in the proposed Sites Reservoir footprint during fall, spring, and winter. Relatively minor summer use has been documented within the proposed reservoir footprint. Relatively high densities have been documented at Funks Reservoir and along the proposed Delevan Pipeline route.

Olive-Sided Flycatcher

The olive-sided flycatcher occurs in western Glenn and Colusa counties. Preferred habitat includes mixed conifer, montane hardwood conifer, Douglas fir, redwood, red fir, and lodgepole pine. It is most common in forested habitats near open terrain (Mayer and Laudenslayer, 1988c).

Olive-sided flycatchers were not observed within the Primary Study Area, and potentially suitable habitat is generally absent at this low elevation.

Prairie Falcon

The prairie falcon nests in inland portions of the northern Coast Range, and winters in that area as well as within the Sacramento Valley. Preferred nesting habitat is a variety of open habitats (primarily perennial grasslands, savannas, rangeland, or open agricultural types) with a nearby sheltered cliff ledge. Winter migrants use a variety of open habitats (Mayer and Laudenslayer, 1988c).

Individual prairie falcons are occasionally present at the proposed Sites Reservoir footprint during winter and fall, but densities are generally low. The seasonal occurrence of this species suggests that breeding does not occur in the Primary Study Area. Prairie falcons were observed at Funks Reservoir and along the Delevan Pipeline and Sulphur Gap Road. A single prairie falcon was also sighted within the Antelope Island Recreation Area.

Purple Martin

The purple martin is a migratory species that returns to northern California during March and migrates south during September. A variety of habitat types are used for reproduction in the Coast Range including hardwood and coniferous habitats. Preferred breeding habitat includes open older forests and woodlands with suitable snags for nesting. This species forages for insects over a variety of habitats near the nest site including forest, woodland, chaparral, and riparian habitats (Mayer and Laudenslayer, 1988c). This species is known from Lake and Shasta counties.

Potential breeding habitat is generally absent from the Primary Study Area, and no purple martins were observed during field surveys.

Redhead

The redhead is found year round in the Central Valley. This species nests in fresh emergent wetlands where dense stands of cattails and tules border open water (Mayer and Laudenslayer, 1988c). Redheads are known to occur in eastern Glenn and Colusa counties.

Within the Primary Study Area, redheads were observed at Funks Reservoir, and suitable habitat exists at the duck clubs along the proposed Delevan Pipeline route.

Rufous Hummingbird

The rufous hummingbird is a common migrant and uncommon summer resident in California. This hummingbird is found in a variety of habitats that provide nectar-producing flowers, including riparian, open woodland, and chaparral habitats. Breeding occurs only in Trinity and Humboldt counties, but spring migration occurs mostly in the lowlands and foothills (Mayer and Laudenslayer, 1988c).

Rufous hummingbirds were not observed within the Primary Study Area, but could occur during migration.

Short-Eared Owl

The short-eared owl occurs in open habitats with dense vegetation, including annual and perennial grasslands, irrigated pasture, and fresh emergent wetlands. Forest and woodland areas are avoided (Mayer and Laudenslayer, 1988c).

Short-eared owls were observed during diurnal avian line transects at Funks Reservoir and along the proposed Delevan Pipeline route only. No summer use was recorded at any proposed Project facility location. Short-eared owls were regularly observed along the proposed Delevan Pipeline route in the vicinity of Delevan NWR in winter. Nocturnal owl calling identified the presence of a short-eared owl at two locations along the proposed Delevan Pipeline route.

Tricolored Blackbird

The tricolored blackbird is a colonial year-round resident of the Sacramento Valley that uses freshwater emergent wetland habitats (primarily cattail and tules) for nesting. This blackbird forages on the ground in a variety of habitats including grasslands, croplands, and seasonally flooded areas. Tricolored blackbirds may travel many miles between nesting and foraging areas (Mayer and Laudenslayer, 1988c).

Foraging tricolored blackbirds were commonly observed within open grassland habitats within the proposed Sites Reservoir footprint, as well as along the North and Sulphur Gap roads, at Funks Reservoir, and within the Saddle Dam Recreation Area. Although no nesting was observed within the Primary Study Area, suitable nesting habitat is present within the Delevan NWR near the proposed Delevan Pipeline route. Tricolored blackbirds frequently occurred in mixed flocks with Brewer’s blackbirds, red-winged blackbirds, and European starlings.

Tule Greater White-Fronted Goose

The tule greater white-fronted goose winters in California’s Central Valley, where it prefers wetlands dominated by tules, rushes, and cattails. This species also forages in agricultural fields, including rice fields (Shuford and Gardali, 2008). Tule greater white-fronted geese are known to occur in southeastern Glenn County and northeastern Colusa County, mainly on State and federal managed wetlands, but also on private wetlands managed for waterfowl hunting.

No tule greater-white fronted geese were observed within the Primary Study Area, but potentially suitable habitat exists along the proposed Delevan Pipeline route.

Vaux’s Swift

The Vaux’s swift is frequently observed in northern California during migration and less often during the breeding season. No winter use occurs. Preferred nesting habitat includes an appropriate nest site in a large hollow tree, primarily redwood or Douglas fir. This swift may also nest in chimneys or buildings. Vaux’s swifts forage in flight for insects over many habitat types near the nest tree, including riparian and lacustrine habitat (Mayer and Laudenslayer, 1988c).

No Vaux’s swifts were observed within the Primary Study Area.

Western Snowy Plover

The western snowy plover occurs year round along the California coast with a very limited summer distribution inland. Central Valley records are primarily from the San Joaquin Valley. This species frequents sandy or gravelly beaches of estuarine salt ponds or alkali lakes for foraging and nesting (Mayer and Laudenslayer, 1988c).

No western snowy plover were identified within the Primary Study Area. However, potentially suitable habitat is present along the proposed Delevan Pipeline route.

White-Tailed Kite

The white-tailed kite is found year round throughout the Sacramento Valley and adjacent foothill areas. Habitat preference includes open or herbaceous stages of most low-elevation vegetative types, primarily grasslands, meadows, farmland, and emergent wetlands. However, white-tailed kites are frequently associated with agricultural areas. Dense stands of trees are used as communal night roost sites (Mayer and Laudenslayer, 1988c).

White-tailed kites were an uncommon species within the proposed Sites Reservoir footprint. However, one pair of nesting kites was observed in open blue oak habitat near the southern end of the proposed Sites Reservoir in 1999. This species was commonly observed in cropland habitat downstream from Funks Reservoir and less frequently foraging the ungrazed grasslands around Funks Reservoir. Kites were observed along the length of the proposed Delevan Pipeline route, with the greatest habitat use associated with irrigated pasture or croplands as opposed to the more commonly occurring rice fields. Kites were also observed along Sulphur Gap Road. No communal roost trees were identified.

Yellow-Breasted Chat

The yellow-breasted chat, an uncommon warbler, is a migratory species that arrives in California during April and departs by October. Nesting habitats consist of dense riparian understory and other dense shrub habitats near water. Willow and blackberry patches are used extensively (Mayer and Laudenslayer, 1988c).

No yellow-breasted chats were observed within the Primary Study Area. Potentially suitable nesting habitat is generally absent except for a narrow strip of mature riparian habitat along the Sacramento River portion of the proposed Delevan Pipeline route.

Yellow-Headed Blackbird

The yellow-headed blackbird nests in fresh emergent wetland with dense vegetation and deep water, often along borders of lakes or ponds. This species forages in emergent wetland and moist open areas, especially in cropland and the muddy shores of lacustrine habitat (Mayer and Laudenslayer, 1988c). The yellow-headed blackbird is known to breed in Colusa County, including areas of the Delevan NWR.

This species was observed within the Primary Study Area at Funks Reservoir and along the proposed Delevan Pipeline route.

Yellow Warbler

The yellow warbler occurs in a variety of woodland and forest habitats in northern California during the breeding season (April through September). This species prefers open to moderate density forests or woodlands with a dense shrub understory. Yellow warblers are most common in open canopy riparian deciduous habitat (Mayer and Laudenslayer, 1988c).

Yellow warblers are a very uncommon species within the Primary Study Area. Sightings within the proposed Sites Reservoir footprint were restricted to spring in a short reach of riparian habitat between the community of Sites and the Sites Damsite. Habitat use along the proposed Delevan Pipeline route primarily occurred in the vicinity of the Colusa Basin Drain (CBD) and the Delevan NWR.

Mammals

American Badger

The American badger is an uncommon permanent resident found throughout most of California, except for the northern North Coast area. It is most abundant in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Cultivated lands have been reported to provide little usable habitat for this species. The badger digs burrows in friable ("crumbly") soil types for cover and remains underground during the day. The badger frequently reuses old burrows, although it has been known to dig a new den each night, especially in summer (Messick and Hornocker, 1981; Mayer and Laudenslayer, 1988d).

Field surveys documented the American badger in grassland and oak woodland areas at Funks Reservoir, within the proposed Sites Reservoir footprint, at all proposed Recreation Areas, and along portions of all roads. Possible suitable habitat exists at all other proposed Project facility locations.

Pallid Bat

The pallid bat occurs throughout California, except in the high Sierra Nevada from Shasta to Kern counties, and the northwestern portion of California in Del Norte and western Siskiyou counties (Mayer and Laudenslayer, 1988d). This bat inhabits a variety of habitats, including grasslands, shrublands, woodlands, and forests, from sea level up through mixed coniferous forests below 2438 m (8,000 ft). In California, the pallid bat is associated with oak woodlands at lower elevations, and may roost in a variety of places including tree cavities, rock crevices, and human-made structures. The pallid bat prefers roosts where it can be out of sight and wedged into small tight crevices. Such sites include rock crevices, bridges, caves, mines, and hollow trees. The pallid bat uses these roosts in tight spaces to thermoregulate, especially during cooler weather. However, during warmer weather periods, it will roost in open areas, such as the sides of rafters and open barns. Barns seem to be a preferred roost. Breeding occurs from October to February, and young are born from May to June. The young are capable of flight at six weeks of age (Davis and Schmidly, 1947).

Field surveys documented the presence of the pallid bat in the grassland and oak woodland habitat within the proposed Sites Reservoir footprint and along the formerly proposed North and Sulphur Gap roads. A maternity roost was discovered in an abandoned ranch house near the North Road. Possible suitable habitat exists at all other proposed Project facility locations.

Spotted Bat

The spotted bat was thought to be found primarily in the southeastern Sierra foothills, mountains, and desert regions, but range expansions have been documented to include Ventura, Riverside, Mariposa, Kern, San Bernardino, San Diego, Fresno, Inyo, Shasta, Siskiyou, Tehama, Tuolumne, Mono, and Tulare counties (Pierson and Rainey, 1998a). Horizontal rock crevices provide optimal roost sites, although the spotted bat may occasionally also use caves and buildings. The spotted bat is apparently a solitary animal. It mates in the fall, with a single pup born before mid-June. Lactating females have been found from June to August (Mayer and Laudenslayer, 1988d).

Due to the rare nature of this animal and minimal information about its range, it has been included as a potentially occurring species. Field surveys failed to document the presence of the spotted bat within the Primary Study Area.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is found throughout California, in all but subalpine and alpine habitats (Mayer and Laudenslayer, 1988d) Suitable roosting sites are restricted to caves and cave-like structures, such as tunnels, mines, and buildings, where this species roosts in the open, rather than in crevices (Pierson and Rainey, 1998b). Hibernation occurs from October to April. Females return to their natal group every spring, and young are born from May to June. One young is born per year and can fly by three weeks of age. Young are typically weaned at six weeks of age. This species is extremely sensitive to disturbance of roosting sites (Mayer and Laudenslayer, 1988d).

Field surveys failed to document the presence of Townsend's western big-eared bat within the Primary Study Area.

Western Mastiff Bat

The western mastiff bat is an uncommon resident ranging from Monterey County southward through southern California, and from the coast eastward to the Colorado Desert. This species occurs in semi-arid to arid habitats, including deciduous woodlands and annual and perennial grasslands (Mayer and Laudenslayer, 1988d). It primarily roosts in crevices in vertical cliffs of granite or consolidated sandstone, and in broken terrain with exposed rock faces (Dalquest, 1946). It is also occasionally found in high buildings (Howell and Little, 1920), trees, and tunnels. Roost sites may change from season to season. Due to its large size, this bat needs vertical faces to drop from to take flight. The western mastiff bat mates in the months surrounding the early spring, and one young is born between April and September (Mayer and Laudenslayer, 1988d).

No western mastiff bats were documented on Anabat recordings or during field surveys within the Primary Study Area.

Western Red Bat

The western red bat is locally common in some areas of California, occurring from Shasta County to the Mexican border, west of the Sierra Nevada/Cascade crest and deserts. The winter range includes western lowlands and coastal regions south of San Francisco Bay. This species is considered to be highly migratory, with migration occurring between summer and winter ranges. The western red bat roosts primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. There may be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores). This species feeds on insects over a wide variety of habitats, including grasslands, shrublands, open woodlands, and forests. Red bats have been observed feeding around street lights and flood lights. Mating occurs in August and September, and young are born from late May through early June (Mayer and Laudenslayer, 1988d).

During surveys within the Primary Study Area, a juvenile male and juvenile female western red bat were captured along Sulphur Gap Road, immediately adjacent to the southern end of the proposed Sites Reservoir footprint. This species was captured in blue oak woodland habitat; similar suitable habitat exists in the proposed Sites Reservoir footprint, all Recreation Areas with the exception of Saddle Dam, and along portions of most of the roads.

14.2.3.6 Commercially or Recreationally Important Wildlife Species

Up to 58 harvest species (33 birds, 24 mammals, and 1 amphibian) may be found within the Primary Study Area (DFG, 2008a) (Table 14-6).

Wild pigs, and to a lesser extent black bear and mule deer, are important big game species within Colusa and Glenn counties. Field personnel often encountered hunters while conducting wildlife surveys. Detailed information is not available specifically for the Primary Study Area, but figures are available and presented at the county level. During the 2008 hunting season, 56 black bears were reported killed within Colusa and Glenn counties by licensed hunters, representing 2.8 percent of California's total bear harvest for the year (DFG, 2009c). A reported 307 mule deer were killed within Colusa and Glenn counties by licensed hunters, representing 1.9 percent of California's total deer harvest for the year (DFG, 2009d). During the 2006-2007 wild pig hunting season, a reported 374 wild pigs were killed within Colusa and Glenn counties by licensed hunters, representing 8.2 percent of California's total pig harvest for the year (DFG, 2007a).

Table 14-6
Commercially or Recreationally Important Wildlife Species that may Occur within the Primary Study Area

Common Name	Scientific Name
Harvested Amphibians	
Bullfrog*	*Rana catasbeiana*
Harvested Birds	
American coot*	*Fulica Americana*
American crow*	*Corvus brachyrhynchos*
American wigeon*	*Anas Americana*
Band-tailed pigeon	*Columba fasciata*
Blue-winged teal*	*Anas discors*
Bufflehead*	*Bucephala albeola*
California quail*	*Callipepla californica*
Canada goose*	*Branta Canadensis*
Canvasback*	*Aythya valisineria*
Cinnamon teal*	*Anas cyanoptera*
Common goldeneye*	*Bucephala clangula*
Common merganser*	*Mergus merganser*
Common moorhen*	*Gallinula chloropus*
Eurasian wigeon	*Anas Penelope*
Gadwall*	*Anas strepera*
Greater white-fronted goose*	*Anser albifrons*
Green-winged teal*	*Anas crecca*
Hooded merganser*	*Lophodytes cucullatus*
Lesser scaup*	*Aythya affinis*
Mallard*	*Anas platyrhynchos*
Mountain quail	*Oreortyx pictus*
Mourning dove*	*Zenaida macroura*
Northern pintail*	*Anas acuta*
Northern shoveler*	*Anas clypeata*
Redhead*	*Aythya Americana*
Ring-necked duck*	*Aythya collaris*

Table 14-6
Commercially or Recreationally Important Wildlife Species that may Occur within the Primary Study Area

Common Name	Scientific Name
Ring-necked pheasant*	*Phasianus colchicus*
Ross's goose	*Chen rossii*
Ruddy duck*	*Oxyura jamaicensis*
Sooty grouse	*Dendragapus fuliginosus*
Snow goose*	*Chen caerulescens*
Wild turkey*	*Meleagris gallopavo*
Wood duck*	*Aix sponsa*
Harvested Mammals	
American badger*	*Taxidea taxus*
American beaver*	*Castor Canadensis*
American mink	*Mustela vison*
Black bear*	*Ursus americanus*
Black-tailed jackrabbit*	*Lepus californicus*
Bobcat*	*Felis rufus*
Brush rabbit*	*Sylvilagus bachmani*
Common muskrat*	*Ondatra zibethicus*
Coyote*	*Canis latrans*
Desert cottontail	*Sylvilagus audubonii*
Eastern fox squirrel	*Sciurus niger*
Elk	*Cervus elaphus*
Ermine	*Mustela ermine*
Gray fox*	*Urocyon cinereoargenteus*
Long-tailed weasel	*Mustela frenata*
Mule deer*	*Odocoileus hemionus*
Pronghorn	*Antilocapra Americana*
Raccoon*	*Procyon lotor*
Red fox*	*Vulpes*
Striped skunk*	*Mephitis*
Virginia opossum*	*Didelphis virginiana*
Western gray squirre*	*Sciurus griseus*
Western spotted skunk	*Spilogale gracilis*
Wild pig*	*Sus scrofa*

*Species documented during field surveys.

The Delevan NWR and several private duck clubs along the eastern portion of the Delevan Pipeline route provide seasonal waterfowl and pheasant hunting opportunities.

Thirteen of the 58 harvest species that could occur within the Primary Study Area were not observed during field surveys: the Ross' goose, Eurasian wigeon, sooty grouse, mountain quail, band-tailed pigeon, desert cottontail, Eastern fox squirrel, long-tailed weasel, American mink, ermine, western spotted skunk, pronghorn, and elk.

Southwestern Colusa County includes a large portion of the management unit for the free-ranging Cache Creek Tule elk herd, which is estimated at a minimum of 187 animals. Two sub-herds frequent the Colusa County portion of the management area, which is southwest of the Primary Study Area. The range of these sub-herds has not been documented to include the Primary Study Area. The East Park Reservoir Tule elk herd, which is estimated at a minimum of 95 animals, is located west of the Primary Study Area. This herd tends to stay within 2 miles of East Park Reservoir and has not been documented within the Primary Study Area, but the hunt zone for this herd overlaps with the northern half of the footprint of the proposed Sites Reservoir, as well as with the Stone Corral, Peninsula Hills, and Saddle Dam recreation areas, Funks Reservoir, Holthouse Reservoir, most roads (excluding Sulphur Gap, Com, and Lurline roads), and portions of the Delevan Pipeline and T-C and GCID canals (Hobbs, pers. comm., 2010).

A small herd of pronghorn is present in Glenn County, north of the Primary Study Area. This herd was incidentally observed several times by field personnel, including along Maxwell Sites Road and Road 68, but their range has not been documented to include the footprint or construction disturbance area of facilities included in the Primary Study Area.

The remaining 11 unobserved wildlife species were not the focus of survey efforts. Suitable habitat exists for each, so it is, therefore, possible that they are present within the Primary Study Area.

14.3 Environmental Impacts/Environmental Consequences

14.3.1 Regulatory Setting

Terrestrial biological resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

14.3.1.1 Federal Plans, Policies, and Regulations

- National Environmental Policy Act
- Central Valley Project Improvement Act
- Federal Endangered Species Act
- Fish and Wildlife Coordination Act
- Executive Order 11312: Invasive Species
- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act

14.3.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act
- California Endangered Species Act
- California Fish and Game Code Sections 3503, 3503.5, 3511, 4700, and 5050

14.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan
- Colusa County Voluntary Oak Woodlands Management Plan

14.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for biological resources:

Would the Project:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game (DFG) or U.S. Fish and Wildlife Service (USFWS)?
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by DFG or USFWS?
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
- Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), Natural Community Conservation Plan (NCCP), or other approved local, regional, or state HCP?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A substantial adverse effect, including mortality, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS.
- A substantial adverse effect, including alteration of habitat suitability, on any wildlife habitat, especially riparian habitat or other sensitive natural communities identified in local or regional plans, policies, regulations, or by DFG or USFWS.
- Substantial interference with the movement of any native resident or migratory wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Indirect effects on common wildlife from human disturbance.
- Conflict with the provisions of an adopted HCP, NCCP, or other approved local or regional HCP, or conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

14.3.3 Impact Assessment Assumptions and Methodology

14.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to terrestrial biological resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- Borrow areas for dam construction materials would be located within the proposed Sites Reservoir footprint, or materials would be obtained from commercial sources outside of the Primary Study Area.
- Frequent Sites Reservoir water level fluctuations would create a barren drawdown zone.
- For all Project facilities that do not have a defined construction disturbance area, an additional 10 percent of the facility footprint acreage is assumed to be the size of the associated disturbance area.
- Periodic maintenance of the proposed pipelines and transmission lines would be conducted on foot and/or by using established roads for vehicle access, and would not require vehicle access over established or restored vegetation.

14.3.3.2 Methodology

Impacts to common wildlife were assessed in relation to habitat alteration or destruction. Direct wildlife impacts include permanent loss of habitat, mortality, injury, displacement, disruption of travel corridors, and disturbance. Indirect wildlife impacts include disturbance activities that result indirectly from the Project (i.e., increased vehicle traffic, increased foot traffic, and noise), as well as changes to habitat suitability. Analysis of the impacts of human disturbance to common wildlife included consideration of the impacts of human disturbance to special-status wildlife species. Impacts can be positive or negative, and can be short-term (temporary) or long-term (permanent).

Approximately 15 percent of the total footprint of each Recreation Area would be subject to permanent construction disturbance. Because the exact location and area affected by the construction of the recreation facilities within the Recreation Areas is not known, the extent of permanent habitat loss was estimated by applying a 15 percent multiplier to each habitat type present.

Of the 200-foot-wide total construction disturbance area associated with road construction, an approximate average of 60 feet (30 percent) would result in the permanent loss of wildlife habitats. A 30 percent multiplier was, therefore, applied to each habitat type present.

For the Delevan Transmission Line, a worst-case scenario of 70 transmission towers with a concrete pad for a base along the entire length of the transmission line was used to calculate the area of permanent disturbance for Alternatives A and C. A worst-case scenario of 15 transmission towers with a concrete pad for a base for the length of the transmission line was used to calculate the area of permanent disturbance for Alternative B.

Calculated acres of natural habitats and agricultural lands represent the 2009 baseline conditions (i.e., Existing Conditions).

The terrestrial biological resources impact assessment relied on hydrologic and operational modeling performed using CALSIM II to provide a quantitative basis from which to assess the potential impacts of the alternatives on riparian and wetland habitat in portions of the Extended and Secondary study areas. Monthly river flows, and water surface elevations derived based on monthly river flows and end-of-month reservoir storages from CALSIM II, provided a quantitative basis to assess the potential impacts of operations on these habitat types, relative to the CEQA and NEPA bases of comparison, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). Detailed discussion of the CALSIM II model is provided in Appendix 6B.

Further, in assessing the impacts to the valley foothill riparian vegetation along the Sacramento River in the Secondary Study Area, modeling specific to riparian vegetation, including results from the SRH-1DV and SacEFT models, were used.

The SRH-1DV model simulated the establishment, growth, and mortality of vegetation, in addition to computing hydraulics and groundwater surface in the riparian zone near the river. The simulation tracked daily vegetation changes through 82 years of simulated flow, within the 107 river miles of Sacramento River from upstream of Red Bluff (RM 250) to upstream of Colusa (RM 143). SRH-1DV analysis focused on four key valley foothill riparian vegetation types: cottonwood, mixed forest, Gooding’s black willow, and narrow leaf willow. The detailed description of the SRH-1DV model and the associated alternatives evaluation is provided in Appendix 8A.

The SacEFT is a decision support tool that linked flow management actions on the Sacramento River to changes in the physical habitats for several focal species of concern. It specifically includes performance measures for evaluating the effects of various flow scenarios on the initiation success and post-initiation scour risk of the Fremont Cottonwood seedlings, as well as on habitat potential/suitability and peak flow during the nesting period for bank swallows. These performance measures were used as a general indicator for assessing the impacts on riparian vegetation and bank swallow colonies along the Sacramento River in the Secondary Study Area. The detailed description of the SacEFT model and the associated alternatives evaluation is provided in Appendix 8B.

14.3.4 Topics Eliminated from Further Analytical Consideration

Because no Project facilities would be constructed or maintained within the Extended Study Area, only operational impacts associated with Alternatives A, B, and C are discussed in the impacts analysis for the Extended Study Area for the three alternatives.

Because no construction or maintenance activities would occur within the Secondary Study (with the exception of the Red Bluff Pumping Plant), only operational impacts associated with Alternatives A, B, and C are discussed in the impacts analysis for the reservoirs and waterways included in the Secondary Study Area for the three alternatives.

Because the Primary Study Area Project facilities with an above-ground footprint would result in permanent wildlife habit loss during their construction, the impact of the operation and maintenance of those facilities on wildlife habitat (**Impact Wild-1**) is not discussed.

Similarly, when the permanent loss or conversion of a wildlife habitat type resulting from Project facility construction would make that location unsuitable for, or unable to support, specific special-status wildlife species, the impact of the operation and maintenance of that facility on the species (**Impact Wild-2**) is not discussed. Operation and maintenance impacts are discussed, however, for the bald eagle and golden eagle because those species would still be located in the Sites Reservoir and Dams area after Project construction is complete. Operation and maintenance impacts are not discussed for the remaining wildlife species because those species would lose their suitable habitat during Project construction, and would, therefore, no longer be present.

Operation and maintenance of the GCID Canal Facilities would resume following completion of the Project's construction activities associated with the proposed GCID Canal Facilities Modifications, and would have no Project-related impacts on wildlife or wildlife habitat. Therefore, operation and maintenance impacts associated with this facility are not discussed further.

For the proposed underground pipelines within the Primary Study Area, operations would occur underground and be coordinated remotely; therefore, the impacts of pipeline operation are not discussed.

Within the Project Buffer, no on-the-ground activities would occur during Project operation. Therefore, the impact of Project operation within the Project Bufferis not discussed.

14.3.5 Impacts Associated with the No Project/No Action Alternative

14.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to wildlife habitat has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Urbanization that is planned according to General Plans could be expected to cause the conversion of natural wildlife habitats to urban uses. However, General Plans and any related construction activities would be subject to their own environmental reviews. Therefore, population growth associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to special-status wildlife species.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to the effects of human disturbance on common wildlife.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to conflicts with habitat plans.

San Luis Reservoir

Modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in the same or slightly decreased water level elevations during most water years, and the same or slightly increased water level elevations during Dry and Critical years at San Luis Reservoir.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Negligible fluctuations in San Luis Reservoir surface water elevations that are expected with implementation of the No Project/No Action Alternative would not be expected to adversely affect the small amount of riparian or wetland habitat that exists around the reservoir because the habitat is located in seeps and is already subject to large water level fluctuations. Because the reservoir already experiences large water level fluctuations, the relative availability of open water (lacustrine) habitat would not be expected to change. Slight changes in surface water elevations at San Luis Reservoir resulting from implementation of the No Project/No Action Alternative would, therefore, **not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because slight changes in surface water elevations at San Luis Reservoir would have a less-than-significant impact on lacustrine, riparian, and wetland habitat, the water level fluctuations would not be expected to have a substantial adverse effect on wildlife species associated with those habitat types. Therefore, slight changes in surface water elevations at San Luis Reservoir resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

None of the projects included in the No Project/No Action Alternative are located at San Luis Reservoir. Therefore, there **would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated water level fluctuations at San Luis Reservoir associated with implementation of the No Project/No Action Alternative would be within the historical range of operation, when compared to Existing Conditions, and consequently would not conflict with any HCPs, NCCPs, or local ordinances. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

14.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in no change to surface water elevations at Trinity or Shasta lakes, and therefore, **would not have a substantial adverse effect** on the surrounding wildlife habitat. Modeling results indicate slight decreases in surface water elevations at Lake Oroville and Folsom Lake, but the small decreases would not be expected to affect the lacustrine or surrounding riparian or wetland habitats. Therefore, the impacts of small surface water elevation fluctuations on wildlife habitat at these two reservoirs resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in no change to surface water elevations at Trinity or Shasta lakes, and therefore, **would not have a substantial adverse effect** on special-status species. Because slight changes in surface water elevations at Lake Oroville and Folsom Lake would have a less-than-significant impact on lacustrine, riparian, or wetland habitats, the water level fluctuations would not be expected to have a substantial adverse effect on wildlife species associated with those habitat types. Slight changes in surface water elevations at these two reservoirs resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to wildlife habitat has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion. That discussion is also applicable to conflicts with habitat plans.

Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling was not conducted for Lewiston Lake, Keswick Reservoir, Lake Natoma, or the Thermalito Complex. However, modeling conducted on the reservoirs upstream of these reservoirs indicates that the No Project/No Action Alternative, when compared to Existing Conditions, would result in either no change or slight changes to surface water level elevations. Because these reservoirs would continue to operate as regulating reservoirs, it is expected that there would be little or no change in surface water level elevations, and therefore, they **would not have a substantial adverse effect** on the lacustrine or surrounding riparian or wetland habitat. Modeling was conducted for Whiskeytown Lake for flows downstream of the lake, and flows would experience slight changes. Because the reservoir upstream of Whiskeytown would experience slight changes, and the flows released from Whiskeytown would experience slight changes, surface water elevations associated with implementation of the No Project/No Action Alternative would not be expected to fluctuate, and therefore, **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because slight changes in surface water elevations at these four reservoirs and the Thermalito Complex would have a less-than-significant impact on lacustrine and the surrounding riparian or wetland habitat, the water level fluctuations would not be expected to have a substantial adverse effect on wildlife species associated with those habitat types. Slight changes in surface water elevations at these facilities resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for the No Project/No Action Alternative. That discussion is also applicable to conflicts with habitat plans.

Trinity River

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results for Trinity River flows downstream of Lewiston Lake for the No Project/No Action Alternative, when compared to Existing Conditions, indicate slight changes in flows during Below Normal, Dry, or Critical water years. However, large decreases in flow are indicated during Wet water years during the months of March and April, and large increases in flows are indicated in Above Normal water years in the month of February. These changes in the flow regime have the potential to adversely affect riparian habitat. However, riparian habitat is adapted to flow variations. The expected decreases in spring flows during Wet water years and the expected increases in flow during late winter in Above Normal water years would, therefore, not be expected to substantially adversely affect riparian vegetation. These modifications of the flow regime of the Trinity River resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Trinity River flow regime in Wet and Above Normal water years would have a less-than-significant impact on riparian habitat, the water level fluctuations would not be expected to have a substantial adverse effect on riparian-associated wildlife species. Changes in the Trinity River flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status terrestrial wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Klamath River downstream of the Trinity River

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results for the Klamath River downstream of the Trinity River for the No Project/No Action Alternative, when compared to Existing Conditions, indicate negligible changes in flows. These negligible changes in the flow regime would not be expected to adversely affect riparian vegetation. Implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Klamath River downstream of the Trinity River would be negligible and would not adversely affect riparian vegetation, they would also not be expected to have an adverse effect on riparian-associated wildlife species. Implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Spring Creek

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Operational modeling was not performed for Spring Creek. However, with implementation of the No Project/No Action Alternative, operations of Whiskeytown Lake and Keswick Reservoir are expected to result in small changes, and therefore, would not be expected to affect the released flows that dilute Spring Creek runoff. Because no change in the dilution of Spring Creek runoff is expected with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to special-status wildlife species.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Sacramento River

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in negligible changes to the flow regime of the Sacramento River, with the exception of decreased flows downstream of Keswick in November during Dry years. Large changes in the flow regime have the potential to adversely affect riparian habitat. However, riparian habitat is adapted to flow variations, and changes in flow during one month in Dry years would not be expected to substantially adversely affect riparian vegetation. Therefore, the modifications to the flow regime of the Sacramento River resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Sacramento River flow regime in November during Dry years would have a less-than-significant impact on riparian habitat, the flow regime changes would not be expected to have a substantial adverse effect on riparian-associated wildlife species. Changes in the Sacramento River flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Clear Creek

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in small changes to the flow regime of Clear Creek, with the exception of large increases in flows during Critical years. These changes in the flow regime have the potential to adversely affect riparian habitat. However, an increase in flow during Critical years could reduce or prevent the desiccation of riparian vegetation. Therefore, changes to the flow regime of Clear Creek resulting from implementation of the No Project/No Action Alternative would have a **potentially beneficial effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Clear Creek flow regime during Critical years would have a potentially beneficial impact on riparian habitat, the flow regime changes would not be expected to have an adverse effect on riparian-associated wildlife species. Changes in the Clear Creek flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Feather River

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in numerous large changes to the flow regime of the Feather River. These changes in the flow regime have the potential to adversely affect riparian habitat. The changes to the flow regime that are most likely to affect riparian habitat include greatly increased flows ranging from June through September in all but Dry water year types, with the exception of decreases in July in Critical years. The increased flows have the potential to inundate riparian vegetation. Adverse effects could also result from large decreases in flows during late August in Dry years, which could desiccate riparian vegetation. The modifications of the existing flow regime of the Feather River resulting from implementation of the No Project/No Action Alternative could substantially adversely affect riparian vegetation, and therefore, **would have a potentially substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the Feather River flow regime would have a potentially significant impact on riparian habitat, the flow regime changes would also potentially have a substantial adverse effect on riparian-associated wildlife species. The increased June through September flows that could adversely affect riparian habitat could also inundate bank swallow burrows during the breeding season. Changes in the Feather River flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would have a potentially substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Sutter Bypass

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in small changes in spills into Moulton, Tisdale, and Ord Ferry weirs. Colusa Weir would experience a decrease in spills during November, especially in Dry years. Changes to the flow regime of the Sutter Bypass have the potential to adversely affect riparian habitat. However, three of the four weirs that spill into the Bypass are not expected to experience large changes in flows, and Colusa weir would only experience large decreases in flood flows during November. The riparian habitat within the Sutter Bypass has adapted to flow variations, and changes in flow from one weir during one month would not be expected to substantially adversely affect the riparian vegetation. Therefore, the modifications of the existing flow regime of the Sutter Bypass resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes in spills into the Sutter Bypass would have a less-than-significant impact on riparian habitat, the changes to the flow regime would not be expected to have a substantial adverse effect on riparian-associated wildlife species. Changes in the Sutter Bypass flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Yolo Bypass

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in small changes in monthly flows into the Yolo Bypass, with the exception of large decreases in flow during late fall in Below Normal and Dry years. Changes to the flow regime of the Yolo Bypass have the potential to adversely affect riparian habitat. However, riparian habitat is adapted to flow variations, and decreases in flood flows during late fall in Below Normal and Dry years would not be expected to substantially adversely affect riparian vegetation. Therefore, the modifications to the flow regime of the Yolo Bypass resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes in spills into the Yolo Bypass would have a less-than-significant impact on riparian habitat, the changes to the flow regime would not be expected to have a substantial adverse effect on riparian-associated wildlife species. Changes in the Yolo Bypass flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status terrestrial wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

American River

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in decreases in flows on the American River in all months. Large decreases in flow are also indicated in September of Above Normal years, September and October of Below Normal years, and in July and August in Critical years. This reduction in flows, coupled with the substantial reductions in flows during early fall in Below Normal and Dry water year types, has the potential to adversely affect riparian habitat by desiccating established vegetation and reducing recruitment. The modifications to the existing flow regime of the American River resulting from implementation of the No Project/No Action Alternative, therefore, **would have a potentially substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes to the American River flow regime would have a potentially significant impact on riparian habitat, the flow regime changes could also have a substantial adverse effect on riparian-associated wildlife species. Changes in the American River flow regime resulting from implementation of the No Project/No Action Alternative, therefore, **would have a potentially substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Sacramento-San Joaquin Delta

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in negligible changes in Sacramento-San Joaquin Delta monthly outflow. This lack of change to Sacramento-San Joaquin Delta outflow resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to special-status wildlife species.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall negligible change in the position of X2, as well as an overall negligible change in Delta monthly outflow. Therefore, Suisun, San Pablo, and San Francisco bays would also be expected to experience negligible changes. Negligible changes in the flow regime of these bays resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because changes in the flow regime of the bays would have a less-than-significant impact on riparian and wetland habitat types, the changes to the flow regime would not be expected to have a substantial adverse effect on riparian- or wetland-associated wildlife species. Changes in the flow regime of the three bays resulting from implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect** on special-status terrestrial wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-4** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to conflicts with habitat plans.

14.3.5.3 Primary Study Area – No Project/No Action Alternative

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

With implementation of the No Project/No Action Alternative, the Project would not be built and there would, therefore, be no construction, operation, or maintenance impacts within the Primary Study Area. Additionally, none of the 14 projects included in the No Project/No Action Alternative are located within the Primary Study Area. Despite expected growth within Glenn and Colusa counties throughout the period of Project analysis (i.e., 100 years), no large-scale construction or growth is anticipated in the Primary Study Area. Funks Reservoir would be expected to continue to operate at current levels as a regulating reservoir. Landowners would continue to graze cattle, harvest crops, modify land uses based on the value of crops, and harvest fuel wood at levels similar to current practices. These continued activities would not be expected to decrease current habitat quantity, but could affect habitat quality.

Continued cattle grazing in areas that have unrestricted access to creeks would continue to degrade the quality of riparian habitat. The removal of blue oaks reduces habitat quality by reducing canopy cover and tree density. Continued fuel wood harvest, at the rate that has been observed since 2000, would eliminate large areas of blue oak woodland habitat because tree removal eventually converts the woodlands to annual grassland habitat. Therefore, the continued land use activities within the Primary Study Area that would continue to occur with implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect** on wildlife habitat, when compared to Existing Conditions.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because continued land use practices would have a potentially significant impact on riparian and blue oak woodland habitat, the habitat modifications could also have a substantial adverse effect on riparian- and blue oak woodland-associated wildlife species. However, no State- or federally-listed wildlife species were documented within the Primary Study Area that are associated with, or dependent upon, these wildlife habitats. Therefore, the continued land use activities within the Primary Study Area that would continue to occur with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on special-status wildlife species, when compared to Existing Conditions.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

None of the projects included in the No Project/No Action Alternative would occur within the Primary Study Area. Therefore, **there would not be a substantial adverse effect** on terrestrial wildlife from human disturbance associated with construction, operation, or maintenance-related activities, when compared to Existing Conditions.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

There are no HCPs or NCCPs that address the Primary Study Area. Additionally, none of the projects included in the No Project/No Action Alternative would occur within the Primary Study Area. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

14.3.6 Impacts Associated with Alternative A

14.3.6.1 Extended Study Area – Alternative A

<u>Construction, Operation, and Maintenance Impacts</u>

Agricultural Water Use

Operational modeling indicates that implementation of Alternative A would result in increased water supply reliability in all years for agricultural water users, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Increased agricultural water supply reliability has the potential to increase the amount of land in agricultural production, which could result in the conversion of natural wildlife habitats. The increased water supply reliability also has the potential to cause changes in cropping patterns, such as from annual crops to orchards. The surface water could also be used to replace existing groundwater use, which would have no effect on wildlife habitats. The actual effect would vary by region depending on water availability and associated costs. However, modeling results show that the potential effects of increased water supply reliability would be small, and would not occur on a large enough scale to have a substantial adverse effect on wildlife habitats. Therefore, the increase in water supply reliability to agricultural water users associated with implementation of Alternative A would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because increased agricultural water supply reliability has the potential to result in the conversion of natural wildlife habitats and to change cropping patterns, the increased reliability could result in decreased habitat suitability for wildlife species. However, modeling results show that the potential effects of increased water supply reliability would be small, and they would, therefore, not be expected to have a substantial adverse effect on wildlife. Therefore, the increase in water supply reliability to agricultural water users associated with implementation of Alternative A would have a **less-than-significant** impact on special-status terrestrial wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with the increased water supply reliability resulting from implementation of Alternative A. Therefore, there would be **no impact** to wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Modeling results show that the potential effects of increased water supply reliability to agricultural water users would be small, and they would, therefore, not be expected to have a substantial adverse effect on wildlife or wildlife habitat. Therefore, increased water supply reliability associated with implementation of Alternative A would not conflict with any HCPs, NCCPs, or local ordinances, and would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Municipal and Industrial Water Use

Operational modeling indicates that implementation of Alternative A would result in increased water supply reliability to municipal and industrial water users in Dry years, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Increased water supply reliability has the potential to accommodate population growth, which could result in the conversion of natural wildlife habitats to urban/disturbed habitat. However, water supply reliability would not be increased in all water year types, and the increased reliability during Dry years would not be expected to accommodate population growth. Therefore, increased water supply reliability for municipal and industrial water users during Dry years resulting from implementation of Alternative A would result in a **less-than-significant** impact to wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because increased water supply reliability for municipal and industrial use would not be expected to adversely affect wildlife habitat, it would not be expected to affect wildlife species. Therefore, increased municipal and industrial water supply reliability resulting from implementation of Alternative A would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with the increased water supply reliability resulting from implementation of Alternative A. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because increased water supply reliability for municipal and industrial use would not be expected to adversely affect wildlife or wildlife habitat, it would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Wildlife Refuge Water Use

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Level 4 water supply would benefit numerous wildlife species that use fresh emergent wetland habitat. Implementation of Alternative A would provide an alternate source of wildlife refuge water in some years, but would not increase its reliability. Therefore, the provision of an alternate source of wildlife refuge water supply would have **no impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because the provision of an alternate source of wildlife refuge water supply would have no impact on wildlife habitat, it would also be expected to have **no impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with the provision of an alternate source of wildlife refuge water supply. Therefore, there would be **no impact** to wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because the provision of an alternate source of wildlife refuge water supply would not affect wildlife or wildlife habitat, it would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

San Luis Reservoir

San Luis Reservoir experiences severe water level fluctuations. Operational modeling indicates that implementation of Alternative A would result in continued water level fluctuations at San Luis Reservoir, but the fluctuations would occur more often and could be more severe, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Severe water level fluctuations could adversely affect the wetland and riparian scrub vegetation that exists within the tributary drainages in the San Luis Reservoir drawdown zone. However, these patches of wetland and riparian vegetation are located in areas that have their own hydrology, and have historically been subjected to severe drawdowns. These habitat types would not be expected to be substantially adversely affected by continued fluctuations at an increased rate. Therefore, the increased fluctuations in water levels at San Luis Reservoir resulting from implementation of Alternative A would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Severe water level fluctuations could affect the quality of wetland and riparian scrub vegetation that exists within the tributary drainages in the San Luis Reservoir drawdown zone. Fluctuations could also reduce habitat suitability for wildlife that rely on the reservoir as a drinking water source because they could have a longer distance to travel from the cover of vegetation to the water’s edge. Small mammals, reptiles, and amphibians would have an increased risk of predation as the distance from the annual grassland or blue oak woodland habitat to the water’s edge increases. However, alternate water sources exist in the streams, creeks, springs, and seeps surrounding the reservoir.

Severe water level fluctuations could also result in a reduction of the open water portion of the lacustrine habitat that may be used by avian species of special concern. However, these avian species, as well as the riparian-associated small mammals, reptiles, and amphibians, have historically been subjected to severe drawdowns at the reservoir and have adapted to those conditions. These species would not be expected to be substantially adversely affected by continued fluctuations at an increased rate. Therefore, the increased fluctuations in water levels at San Luis Reservoir resulting from implementation of Alternative A would have a **less-than-significant impact** on special-status terrestrial wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with the operational changes at San Luis Reservoir resulting from implementation of Alternative A. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated water level fluctuations at San Luis Reservoir resulting from implementation of Alternative A would be within the historical range of operation, and consequently, would not conflict with any HCPs, NCCPs, or local ordinances. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

14.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Operational modeling indicates that implementation of Alternative A would provide operational flexibility to Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake, when compared to Existing Conditions and the No Project/No Action Alternative. Storage at these reservoirs would be improved in all months of all years, including during May through October in Dry and Critical year conditions. In other years, larger releases would be made to stabilize fall flow conditions. Seasonal and monthly improvements in storage would occur, when compared to Existing Conditions and the No Project/No Action Alternative. In addition to improved storage conditions, operational modeling indicates that these reservoirs would experience a reduced range of change in fluctuations, resulting in less severe drawdowns.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Frequent and severe drawdowns tend to favor the establishment of upland plant communities along the shoreline, rather than riparian vegetation. A reduction in the reservoir level fluctuations has the potential to allow the establishment of riparian habitat in these shoreline areas. Therefore, changes in operations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake associated with implementation of Alternative A that would result in improved storage conditions and reduced water level fluctuations would have a **beneficial effect** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The lacustrine habitat of these reservoirs supports numerous species of terrestrial wildlife, including the special-status bald eagle. Nesting bald eagles have been documented along the edge of each of these reservoirs. Bald eagle productivity would decrease as water surface elevation would decrease, so changes in reservoir surface water elevation fluctuations have the potential to adversely affect this species. However, the improved storage and reduced reservoir level fluctuations at these reservoirs would increase habitat suitability for bald eagles. These operational improvements would also be beneficial to the lacustrine wildlife species that use open water habitat, as well as wildlife that depend on the reservoirs as a source of drinking water. Therefore, changes in operations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake associated with implementation of Alternative A that would result in improved storage conditions and reduced water level fluctuations would have a **beneficial effect** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with improved storage conditions at these reservoirs. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime or storage conditions of Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake resulting from implementation of Alternative A would be within the historical range of operation, and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex

Whiskeytown Lake is expected to operate as it has historically as a regulating reservoir for flow coming through the Clear Creek Tunnel. Lewiston Lake, Keswick Reservoir, Lake Natoma, and the Thermalito Complex (which includes the Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay) are also expected to continue to operate, as they have historically, as regulating reservoirs for upstream reservoirs.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Changes in reservoir surface water elevation fluctuations have the potential to adversely affect surrounding wildlife habitats. However, because no change in operation is expected at any of these reservoirs as a result of implementation of Alternative A, the lacustrine and surrounding habitat types would not be affected. Therefore, there would be **no impact** to wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The lacustrine habitat of these reservoirs supports numerous species of terrestrial wildlife, including the special-status bald eagle. Nesting bald eagles have been documented along the edge of Lewiston Lake, Whiskeytown Lake, and the Thermalito Diversion Pool. Suitable giant garter snake habitat exists within portions of the Thermalito Forebay and Afterbay and in immediately adjacent areas. The Thermalito Afterbay also supports a mixed Clark's and western grebe nesting colony. Changes in reservoir surface water elevation fluctuations have the potential to adversely affect these species. However, because no change in operation is expected at any of these reservoirs as a result of implementation of Alternative A, and the habitat types that these species are associated with are not expected to be affected, there would be **no impact** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. Changes in reservoir surface water elevation fluctuations have the potential to adversely affect the Clark's and western grebe nesting colony. However, because no change in operation is expected at the Thermalito Afterbay as a result of implementation of Alternative A, there would be **no impact** to these nesting colonies, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with the operation of these reservoirs. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because no change in operation is expected at any of these reservoirs as a result of implementation of Alternative A, there would be no conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Trinity River

Operational modeling indicates that Trinity River flows would meet or exceed the Trinity River Record of Decision (ROD) requirements with implementation of Alternative A. Project operations could change the timing of flows through the Clear Creek Tunnel, but not the amount supplied. Modeling results show little change from the existing flow schedule, and the small amount of change would rarely occur.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Modifications to the existing flow regime could have an adverse effect on the montane and valley foothill riparian habitats along the Trinity River. However, because the ROD requirements would be met or exceeded, and implementation of Alternative A would result in occasional small changes to the existing flow schedule, these habitat types would not be expected to be substantially adversely affected. Therefore, changes to the flow regime of the Trinity River resulting from implementation of Alternative A would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The montane and valley foothill riparian habitats along the Trinity River support numerous wildlife species, including the special-status bald eagle, osprey, and willow flycatcher. The nearshore portion of the riverine habitat also supports numerous wildlife species, including the special-status foothill yellow-legged frog. Modifications of the existing flow regime could have an adverse effect on these habitat types and their associated wildlife species. However, because the ROD requirements would be met or exceeded, and implementation of Alternative A would result in occasional small changes to the existing flow schedule, these habitat types would not be expected to be substantially adversely affected. Therefore, changes to the Trinity River flow regime resulting from implementation of Alternative A would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes in Trinity River flows resulting from implementation of Alternative A. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Trinity River resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Klamath River downstream of the Trinity River

Operational modeling indicates that implementation of Alternative A would not affect the Klamath River flow regime.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Montane and valley foothill riparian habitats are located along the lower Klamath River. Modifications of the existing flow regime could have an adverse effect on these habitat types. However, implementation of Alternative A would not change the existing flow regime of the Klamath River. Therefore, there would be **no impact** to wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The montane and valley foothill riparian habitats along the lower Klamath River support numerous wildlife species, including the special-status bald eagle and osprey. The nearshore portion of the riverine habitat also supports numerous wildlife species. Modifications of the existing flow regime could have an adverse effect on these wildlife species. However, implementation of Alternative A would not change the existing flow regime of the Klamath River. Therefore, there would be **no impact** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Implementation of Alternative A would not change the existing flow regime of the lower Klamath River. Therefore, there would be **no impact** to native resident or migratory wildlife species, or to wildlife nursery sites, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with operational effects to the Klamath River resulting from implementation of Alternative A. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because the flow regime of the Klamath River is not expected to be affected by implementation of Alternative A, wildlife or wildlife habitat would not be adversely affected. Consequently, there would be no conflict with any HCPs, NCCPs, or local ordinances, and would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Spring Creek

Operational modeling was not performed for Spring Creek. Spring Creek runoff is diluted by flows from Whiskeytown Lake through the Spring Creek Tunnel before it enters the Sacramento River. Those flows are diluted again by releases from Keswick Reservoir once they enter the Sacramento River.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Implementation of Alternative A would not change operation of Whiskeytown Lake or Keswick Reservoir, and therefore, would not be expected to affect the released flows that dilute Spring Creek runoff. Because no change in the dilution of Spring Creek runoff is expected as a result of implementation of Alternative A, there would be **no impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because implementation of Alternative A would have no impact on Spring Creek wildlife habitat, it would not be expected to adversely affect the wildlife species associated with that habitat. Therefore, implementation of Alternative would have **no impact** on special-status wildlife species on Spring Creek, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with Spring Creek dilution flows. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because no change in operation is expected at Spring Creek as a result of implementation of Alternative A, there would be no conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento River

Operational modeling indicates that Sacramento River flows would meet or exceed the OCAP Biological Opinion requirements with or without the Project. When compared to Existing Conditions and the No Project/No Action Alternative, Alternative A operations would result in changes to the flow regime upstream of the location of Project diversions as a result Project-related operational changes at Shasta Lake. Systematic changes in flows downstream of each of the Project diversions would occur as a result of the combination of Shasta Lake operational changes and the diversion of up to 5,900 cfs at the Project intakes when diversions occur.

Modeling results indicate that there would be no change in the frequency or severity of flood events, and consequently no large change in the movement of sediment or timing of scour events, because the modeling inputs purposely avoided effects to the Sacramento River from regulation and diversion when the flow is between 15,000 and 25,000 cfs. For the Sacramento River upstream of the Project diversions, implementation of Alternative A would result in stage fluctuations of approximately -0.6 to 0.5 feet using the Bend Bridge location as the indicator, when compared to Existing Conditions and the No Project/No Action Alternative. September flows would vary in the amount of increases. Downstream of Project diversions, July and August flow changes would be negligible. Using Wilkins Slough as an indicator for this reach, there would be changes in the stage of approximately -2.3 to 2.8 feet if Alternative A is implemented, when compared to Existing Conditions and the No Project/No Action Alternative. The reduction in stage would mainly occur in the winter and spring months, when the water would be diverted from the Sacramento River to Sites Reservoir; higher stage values would occur in the summer and fall months because of the releases from the Sites Reservoir to the river. Fall flows from Shasta Lake to Project intakes would decrease, but Project releases would stabilize fall flows downstream of the intakes, especially in Dry years.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the valley foothill riparian vegetation alliance along the Sacramento River would increase or would remain similar with implementation of Alternative A relative to Existing Conditions and the No Project/No Action Alternative. For bank swallows, SacEFT modeling indicates negligible effects resulting from peak flow during nesting season and a slight decrease in habitat potential and suitability with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Valley foothill riparian and backwater habitats are located along the Sacramento River. Modifications to the existing flow regime could alter the formation of off-channel habitats. New off-channel habitat is created during large fall and winter flow events, and existing off-channel backwater areas can fill in with sediment and vegetation if these flow events do not occur. However, modeling results indicate that the timing and magnitude of flood events, and consequently the conditions required for creating and maintaining these backwater habitats, would not be expected to change with implementation of Alternative A. Modifications to the existing flow regime could also affect the establishment of riparian habitat, or reduce the survival rate of early successional stages of riparian habitat that already exist. Elderberry shrubs are associated with riparian habitat, but are typically located higher up the slope of the bank rather than at the water’s edge. An increase in river stage has the potential to cause inundation of some shrubs. However, the shrubs likely to be affected are already subjected to seasonal inundation, and the minor increase in river stage during the winter months would be within the historical range of conditions. Operational modeling for Alternative A, including modeling that is specific to riparian habitat, indicates a minimal effect to riparian habitat resulting from the described changes in the flow regime. Therefore, elderberry shrubs are not likely to be adversely affected. Similarly, riparian habitat in general would not be expected to be adversely affected.

It should be noted that although modeling results indicate that there would be only slight changes to backwater or riparian habitat when compared to Existing Conditions or the No Project/No Action Alternative, Existing Conditions is not necessarily good for these species. Implementation of Alternative A is not expected to make these conditions worse, but also is not expected to improve them. Therefore, the impact of modifications of the existing flow regime of the Sacramento River resulting from implementation of Alternative A would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The Sacramento River's backwater habitats support the western pond turtle, and are included in a recovery unit for the giant garter snake. The river's riparian habitat, which includes elderberry shrubs essential to the survival of the valley elderberry longhorn beetle, is known to support osprey, ringtail, and nesting bald eagles and western yellow-billed cuckoos. The largest known breeding population of bank swallows in California nests along the river. Riparian habitat along the Sacramento River may also support Swainson's hawks, long-eared owls, several special-status bat and songbird species, as well as willow flycatchers during migration. Modifications to the existing flow regime of the Sacramento River could have substantial adverse effects on these species.

Modifications to the existing flow regime could alter the formation of off-channel habitats, which could affect the western pond turtle and giant garter snake. However, modeling results indicate that the timing and magnitude of flood events, and consequently the conditions required for creating and maintaining these backwater habitats, would not be expected to change with implementation of Alternative A. Western pond turtles could also be affected by a rise in river stage during the breeding season, which could inundate eggs. Modeling results show, at most, a 4 to 6 inch increase in river stage during June, and minimal change in July or August. Because western pond turtles typically build nests away from the water's edge, an increase of 4 to 6 inches would not be expected to have a substantially adverse effect on this species.

Modifications to the existing flow regime could also affect the establishment of riparian habitat, or reduce the survival rate of early successional stages of riparian habitat that already exist, which in turn could adversely affect riparian-associated species. However, modeling that is specific to riparian habitat indicates a minimal effect to riparian habitat resulting from the described changes in the flow regime associated with implementation of Alternative A. Therefore, the special-status birds and mammals associated with riparian habitat would not be expected to be adversely affected.

Changes in the existing flow regime could result in changes to the frequency of the high flows required to cause sloughing of river banks, which are used by bank swallows, or could result in higher spring flows that have the potential to inundate nesting bank swallows. Modeling results indicate that that there would be no change in the frequency or severity of flood events, and up to a 2 to 4 inch increase in river stage with implementation of Alternative A. Therefore, minimal effects to bank swallow habitat are expected. River stage in June would be increased 4 to 6 inches; this stage increase would be unlikely to inundate bank swallow nests, as the lowest nests are typically located a greater distance from the water level. There would not be an increase in high flows that could cause nest failure. SacEFT modeling specific to the bank swallow indicates that there would be minimal effects to this species.

It should be noted that, although modeling results indicate that there would be only minimal change to backwater habitat and its associated wildlife species, to riparian habitat and its associated wildlife species, or to bank swallows and their habitat requirements associated with Alternative A, when compared to Existing Conditions or the No Project/No Action Alternative, Existing Conditions are not necessarily good for these species. Implementation of Alternative A is not expected to make these conditions worse, but also is not expected to improve them. Therefore, the impact of modifications of the existing flow regime of the Sacramento River resulting from implementation of Alternative A would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the Sacramento River flow regime. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Sacramento River resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump Installation at the Red Bluff Pumping Plant

The installation of the pump would occur within an existing bay at the existing Red Bluff Pumping Plant. The construction activities associated with installing a pump at the existing pumping plant, which would require the use of a crane, are expected to occur along existing construction or access roads. Dewatering of the afterbay would likely be required, and would occur during regularly scheduled maintenance periods or during the non-irrigation season.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Installation of the pump at the existing pumping plant is not expected to involve any ground-disturbing activity, and therefore, would not result in a loss or alteration in habitat suitability. There would, therefore, be **no impact** to wildlife habitat associate with construction activities at the Red Bluff Pumping Plant, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the additional pump could increase the rate of diversion from the Sacramento River by up to 250 cfs. This small increase would not be expected to adversely affect wildlife habitat downstream of the diversion. Therefore, the modification of the existing flow regime resulting from the operation of an additional pump at the Red Bluff Pumping Plant with implementation of Alternative A would have a

less-than-significant impact on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the additional pump could increase the amount of sediment that requires removal. However, sediment removal would occur during the regularly scheduled maintenance period for the canal and would involve the same maintenance activities conducted for Existing Conditions. Maintenance associated with the installation of a pump into an existing pumping plant would, therefore, have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Because pump installation, operation, and maintenance at the Red Bluff Pumping Plant would not be expected to adversely affect wildlife habitat, it would also not be expected to affect the special-status wildlife species associated with those habitat types. Therefore, installation of a pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife may be directly or indirectly affected by the installation, operation, and maintenance of the additional pump. Construction activities, as well as maintenance activities associated with sediment removal, would include the use of heavy equipment, which could lead to increased disturbance to wildlife from noise. Pump operation could result in increased noise levels that may adversely affect wildlife. However, the addition of one pump would not be expected to impact wildlife above the existing level of disturbance already present from operation and maintenance of the other pumps in the pumping plant bay. Therefore, the human disturbance associated with installation and maintenance of this pump would be expected to have a **less-than-significant impact** on wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

The installation of an additional pump into an existing pumping plant bay that already has several pumps in it, associated with implementation of Alternative A, would not adversely affect wildlife or wildlife habitat, and consequently would not conflict with any HCPs, NCCPs, or local ordinances. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Clear Creek

Operational modeling indicates that Clear Creek flow requirements would be met or exceeded in all scenarios. With implementation of Alternative A, Clear Creek would have cooler temperatures resulting from the cooler temperatures in Whiskeytown Lake in Dry and Critical years.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Valley foothill riparian habitat is located along Lower Clear Creek. Modifications to the Clear Creek flow regime could have adverse effects on this habitat type. However, implementation of Alternative A would not change the existing flow regime of Clear Creek, and therefore, would have **no impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The valley foothill riparian habitat along Lower Clear Creek supports numerous terrestrial wildlife species, including the foothill yellow-legged frog. Bank swallows and willow flycatchers have been observed foraging over the riverine and adjacent habitats, and some bank swallow nesting has been documented. Modifications to the flow regime of Clear Creek could have adverse effects on these species. However, Implementation of Alternative A would not change the existing Clear Creek flow regime, and therefore, would have **no impact** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime of Clear Creek. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Implementation of Alternative A would not affect the Clear Creek flow regime and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Feather River

Operational modeling indicates that Feather River flows would meet or exceed the FERC Settlement Agreement's minimum flow requirements in all scenarios. The operational flexibility provided by implementation of Alternative A would result in a Feather River flow regime that would be less reactive to Delta conditions during summer and fall months. Consequently, when compared to Existing Conditions and the No Project/Action Alternative, flows in June through September in drier years would be improved. However, flows would generally be decreased during October, November, and December.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Valley foothill riparian and backwater habitats exist along the Feather River. Modifications to the existing flow regime have the potential to adversely affect these habitat types. However, implementation of Alternative A would allow the river to return to a flow regime that is more stable during summer and fall months. The higher flows that are released during summer months in Existing Conditions to improve Delta conditions have the potential to scour or inundate riparian habitat. Lower and more stabilized flows would reduce these risks. The lower summer flows associated with implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian habitat, and could be beneficial in drier years when flows would be higher than Existing Conditions or the No Project/No Action Alternative. The reduced summer flows would also not be likely to adversely affect the hydrology of backwater habitats. Because the modification of the existing flow regime of the Feather River resulting from implementation of Alternative A would not be expected to adversely affect riparian habitat, and would not be expected to reduce the habitat suitability of the riverine or backwater habitats, this change would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The riverine and valley foothill riparian habitats of the Feather River support numerous species of terrestrial wildlife, including special-status species. Giant garter snakes exist in isolated backwater habitats, and the river is included in a portion of an identified recovery unit for this species. Bald eagles, Swainson's hawks, and bank swallows have been documented nesting along this river, and the western yellow-billed cuckoo has historically bred on the lower river. The riparian habitat also supports the State fully-protected ringtail and western pond turtles. Modifications to the existing flow regime have the potential to adversely affect these species. However, implementation of Alternative A would return the river to a flow regime that is more stable during summer and fall months. The higher flows that are released during summer months in Existing Conditions to improve Delta conditions have the potential to scour or inundate riparian habitat, as well as inundate portions of bank swallow colonies. Lower and more stabilized flows would reduce these risks. The lower summer flows associated with implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian habitat; consequently, riparian-associated species would not be expected to be adversely affected. The reduced summer flows would also not be likely to adversely affect the hydrology of backwater habitats used by the giant garter snake, and the resulting reduction in the velocity and temperature of the river flows could be beneficial to this species. Because the modification of the existing flow regime of the Feather River resulting from implementation of Alternative A would not be expected to adversely affect riparian habitat or riparian-associated species, and would not be expected to reduce the habitat suitability of the riverine or backwater habitats, this change would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The valley foothill riparian habitat of the Feather River supports at least two large mixed heron/egret rookeries. Modifications to the existing flow regime have the potential to adversely affect these rookeries. However, the lower summer flows associated with implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian habitat, and could be beneficial in drier years when flows would be higher than Existing Conditions or the No Project/No Action Alternative. Consequently, these riparian-associated species would not be expected to be adversely affected. Because the modification of the existing flow regime of the Feather River resulting from implementation of Alternative A would not be expected to adversely affect riparian habitat or riparian-associated species, this change would have a **less-than-significant impact** on the mixed heron/egret rookeries, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated modification of the flow regime of the Feather River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Feather River resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sutter Bypass

Implementation of Alternative A would result in the diversion of up to 5,900 cfs during winter flows. These diversions would occur at the T-C, GCID, and Delevan intake structures, all of which are located upstream of, and therefore would affect the hydrology of, the Sutter Bypass. The spills into the Bypass would consequently be reduced by up to 5,900 cfs, which would reduce the velocity and volume of water entering the Bypass, and could delay the point at which the weirs begin to spill.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Riparian and wetland habitats exist within the Sutter Bypass. Modifications of the existing flow regime of the Sutter Bypass could adversely affect these habitat types. The Sutter Bypass has water flowing through it year round. A reduction of the frequency, velocity, and volume of floodwaters entering the Bypass from the Sacramento River as a result of implementation of Alternative A would reduce the amount of flooding, which could impact wetland and riparian habitat by reducing the duration of inundation. However, the riparian and wetland habitats within the bypass are adapted to various degrees of inundation. Therefore, the modification of the existing flow regime of the Sutter Bypass that would result in reduced frequency, velocity, and volume of floodwaters entering the Bypass as a result of implementing Alternative A would be relatively minor and would have a **less-than-significant impact** on riparian and wetland habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Approximately 80 percent of the Sutter NWR is located in the Sutter Bypass. The agricultural, riparian, and wetland habitats within the Sutter Bypass support numerous species of terrestrial wildlife, including a large mixed heron and egret rookery and the special-status giant garter snake, Swainson’s hawk, white-tailed kite, bald eagle, western yellow-billed cuckoo, American white pelican, redhead, least bittern, western pond turtle, and State fully-protected ringtail. The open water habitat created during flooding can provide a similar value to migratory waterbirds as permanent wetlands. The flooding that occurs during high flow events can create deep water suitable for diving ducks. Raptor species forage in recently flooded areas. If the flooding is not substantial, low water levels provide shallow water habitat, which is valuable to wintering dabbling ducks, shorebirds, and wading birds. Modifications of the existing flow regime of the Sutter Bypass could adversely affect these species.

The Sutter Bypass has water flowing through it year round. A reduction of the frequency, velocity, and volume of floodwaters entering the Bypass from the Sacramento River as a result of implementation of Alternative A would reduce the amount of flooding that the refuge experiences, which at times can be up to 12 feet deep. This reduction in the frequency, velocity, and volume of water could benefit small mammals, reptiles, and amphibians because they would have an increased chance of reaching flood refugia before inundation. Therefore, the modification of the existing flow regime of the Sutter Bypass, although relatively minor, would result in reduced velocity and volume of floodwaters entering the Bypass as a result of implementing Alternative A, and would have a **potentially beneficial effect** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The riparian habitat within the Sutter Bypass supports a large mixed heron and egret rookery. Because the relatively minor modification of the existing flow regime of the Sutter Bypass resulting from implementation of Alternative A would not be expected to have an adverse effect on riparian habitat or loss of the nesting colony, the change in flow regime would have a **less-than-significant impact** on the heron and egret rookery, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime of the Sutter Bypass. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Sutter Bypass resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Yolo Bypass

Operational modeling for Alternative A indicates that that there would be a minor reduction in the duration and magnitude of flows entering into the Yolo Bypass.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Riparian and wetland habitats exist within the Yolo Bypass. As floodwaters recede, mudflats are created and smaller areas of open water habitat may remain in the Bypass. A reduction of the frequency, velocity, and volume of floodwaters entering the Bypass as a result of implementation of Alternative A would reduce the amount of flooding, which could impact wetland and riparian habitat by reducing the duration of inundation. However, the riparian and wetland habitats within the bypass are adapted to various degrees of inundation. Therefore, the modification of the existing flow regime of the Yolo Bypass that would result in minor reductions in velocity and volume of floodwaters entering the Bypass as a result of implementation of Alternative A would have a **less-than-significant impact** on riparian and wetland habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The Yolo Bypass includes the Yolo WA. The agricultural, riparian, and wetland habitats within the Yolo Bypass support numerous species of terrestrial wildlife, including the special-status western pond turtle, American white pelican, bald eagle, Swainson's hawk, and greater sandhill crane. When the Bypass floods, the receding water creates mudflats that are used by many shorebird species. After floodwaters recede, smaller areas of open water habitat may remain in the Bypass that has the potential to support foraging waterbirds and raptors, as well as the western pond turtle. A minor reduction of the frequency, velocity, and volume of floodwaters entering the Bypass as a result of implementation of Alternative A would reduce the amount of flooding, which could impact wetland and riparian habitat by reducing the duration of inundation, and consequently impact the special-status species that use these habitat types. However, the riparian and wetland habitats within the bypass are adapted to various degrees of inundation. Therefore, the modification of the existing flow regime of the Yolo Bypass that would result in reduced velocity and volume of floodwaters entering the Bypass as a result of implementing Alternative A would have a **less-than-significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. The modification of the existing flow regime of the Yolo Bypass that would result in reduced velocity and volume of floodwaters entering the Bypass as a result of implementing Alternative A would have a **less-than-significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime of the Yolo Bypass. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Yolo Bypass resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

American River

Operational modeling indicates that implementation of Alternative A would have effects on the American River that are similar to those described for the Feather River. The operational flexibility provided by implementation of Alternative A would result in an American River flow regime that would be more consistent with hydrologic conditions, rather than reactive to Delta conditions. Consequently, when compared to Existing Conditions and the No Project/No Action Alternative, flows would generally be decreased during June through September with the largest reductions in July. However, when compared to the No Project/No Action Alternative, flows would be improved from June through September in drier years.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Valley foothill riparian and backwater habitats exist along the American River. Modifications to the existing flow regime have the potential to adversely affect these habitat types. However, implementation of Alternative A would return the river to a flow regime that is more stable during summer months. The higher flows that are released during summer months in Existing Conditions to improve Delta conditions have the potential to scour or inundate riparian habitat. Lower and more stabilized flows would reduce these risks. The lower and more stable summer flows resulting from implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian habitat, and could be beneficial in drier years from June through September when flows would be higher than the No Project/No Action Alternative. The reduced summer flows would also not be likely to adversely affect the hydrology of backwater habitats. Modification of the existing flow regime in the American River resulting from implementation of Alternative A would not be expected to adversely affect riparian habitat or reduce the habitat suitability of the riverine or backwater habitats, and would, therefore, have a **less-than-significant impact** on these wildlife habitats, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The riverine and valley foothill riparian habitats of the American River support numerous species of terrestrial wildlife, including special-status species. Giant garter snakes exist in backwater habitats, and the river is included in a portion of an identified recovery unit for this species. Western pond turtles and nesting bank swallows have been documented along this river. Modifications to the existing flow regime have the potential to adversely affect these species. However, implementation of Alternative A would return the river to a flow regime that is more stable during summer months. The higher flows that are released during summer months in Existing Conditions to improve Delta conditions have the potential to scour or inundate riparian habitat, as well as inundate portions of bank swallow colonies. Lower and more stabilized flows would reduce these risks. The lower summer flows resulting from implementation of Alternative A would not be likely to have a substantial adverse effect on established riparian habitat, and could be beneficial in dire years from June through September when flows would be higher than the No Project/No Action Alternative. Consequently, riparian-associated species would not be expected to be adversely affected. The reduced summer flows would also not be likely to adversely affect the hydrology of backwater habitats used by the giant garter snake, and the resulting reduction in the velocity and temperature of the summer river flows could be beneficial to this species. Because the modification of the existing flow regime in the American River resulting from implementation of Alternative A would not be expected to adversely affect riparian habitat or riparian-associated species, and would not be expected to reduce the habitat suitability of the riverine or backwater habitats, this change would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes on the American River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the American River resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento-San Joaquin Delta

Operational modeling indicates that implementation of Alternative A would result in a flow reduction in the Delta in December and January, resulting in a 1 to 2 km shift in the position of X2. However, this shift would occur during Wet months when the X2 position is well within compliance of salinity standards for the Delta, and would, therefore, be within the recorded range of salinity tolerance for species present in the Delta. Modeling also indicates an improvement in salinity conditions in August through October, and increased inflows into the Delta during Critical years.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The Sacramento-San Joaquin Delta contains sloughs, emergent wetlands, and saline wetlands. Modifications to the existing flow regime of the Delta could adversely affect these habitat types. However, because the modification of the flow regime associated with implementation of Alternative A would result in a shift in X2 that would be within the historical range of tolerance of these habitats, and because salinity conditions would be improved in August through October, as well as in Critical years, there would be a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The Sacramento-San Joaquin Delta supports numerous wildlife species, including the special-status giant garter snake in the vicinity of Sherman Island, bank swallows along Seven-Mile and Three-Mile sloughs, the California black rail, the greater sandhill crane in emergent wetlands, and the salt marsh harvest mouse in saline wetlands. Modifications to the existing flow regime of the Delta could adversely affect these species. However, because the modification of the flow regime associated with implementation of Alternative A would result in a shift in X2 that would be within the historical range of tolerance of these species, and because salinity conditions would be improved in August through October, as well as in Critical years, there would be a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with flow regime changes in the Delta. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of the Delta resulting from implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Suisun Bay

Operational modeling indicates that the diversions associated with implementation of Alternative A would increase electrical conductivity (EC), which is a measure of changes in salinity, in the Suisun Marsh in December. However, in Existing Conditions and the No Project/No Action Alternative, EC would be very low in December and the substantial increase in EC associated with Project operation would be within the historic range of species tolerance.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Suisun Bay and Marsh contains saline emergent wetlands. Modifications to the existing flow regime of the bay and marsh could adversely affect this habitat type. However, because the modification of the flow regime associated with implementation of Alternative A would result in an increase in EC that would be within the historic range of tolerance of this habitat type, there would be a **less-than-significant impact** on saline emergent wetlands, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Suisun Bay and Marsh support numerous wildlife species, including the special-status California clapper rail, California black rail, and the salt marsh harvest mouse. The majority of breeding California black rails is found in Suisun Marsh. Modifications to the existing flow regime of the bay and marsh could adversely affect these species. However, because the modification of the flow regime associated with implementation of Alternative A would result in an increase in EC that would be within the historic range of tolerance of these species, there would be a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the Suisun Marsh flow regime. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Anticipated changes to the flow regime of Suisun Bay associated with implementation of Alternative A would be within the historical range of operation and would not adversely affect wildlife or wildlife habitat. Consequently, these changes would not conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, have no impact, when compared to Existing Conditions and the No Project/No Action Alternative.

San Pablo Bay and San Francisco Bay

Implementation of Alternative A is not expected to affect the hydrology of San Pablo and San Francisco bays.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

San Pablo and San Francisco bays contain saline emergent wetlands. Modifications of the existing flow regime of these bays could adversely affect this habitat type. However, because no effect to the bays' hydrology is expected from implementation of Alternative A, there would be **no impact** to saline emergent wetlands, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

San Pablo and San Francisco bays support numerous wildlife species, including the special-status California clapper rail, California black rail, and salt-marsh harvest mouse. Modifications of the existing flow regime of these bays could adversely affect these species. However, because no effect due to implementation of Alternative A is expected within San Pablo or San Francisco bays, there would be **no impact** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

No Project-related human disturbance would be associated with changes to the flow regime of San Pablo and San Francisco bays. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Because implementation of Alternative A is not expected to affect the flow regime of San Pablo and San Francisco bays, there would be no conflict with any HCPs, NCCPs, or local ordinances, and would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

14.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area and Sites Reservoir Dams

The construction of a 1.27-MAF Sites Reservoir requires the construction of Sites Dam, Golden Gate Dam, and seven saddle dams. Construction-related ground-disturbing activities, vegetation removal, and the subsequent filling of the reservoir, would result in the direct and permanent loss of wildlife habitats, or the direct conversion of wildlife habitats to lacustrine habitat (Table 14-7).

Table 14-7
Acres of Wildlife Habitat Subject to Direct Permanent Loss from the Construction and Filling of the 1.27-MAF Sites Reservoir and Associated Dams: Alternative A

Habitat	Permanent Loss (Acres)
Annual grassland	11,654.6
Blue oak woodland	353.5
Dryland grain and seed crops	206.9
Lacustrine	20.2
Pasture	61.0
Urban/disturbed	76.1
Valley foothill riparian	81.5
Valley oak woodland	3.4
TOTAL	**12,457.2**

In addition to the permanent loss of habitat, there would also be temporary disturbance of habitat associated with a construction disturbance area outside of the reservoir footprint. The construction disturbance area would be located on the northeast side of the reservoir in the vicinity of the proposed

Sites and Golden Gate dams, and could disturb as much as 1,000 acres of land. Disturbed areas would be restored to their original habitat type after construction is complete. The majority of wildlife habitat that would be disturbed in that area is annual grassland habitat, but disturbance of valley foothill riparian habitat could also occur.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland habitat within the proposed footprint of Sites Reservoir and its dams provides foraging habitat for special-status species, such as the loggerhead shrike, northern harrier, tri-colored blackbird, and pallid bat. Annual grassland also provides burrowing and foraging habitat for the burrowing owl and American badger, and wintering habitat for the ferruginous hawk and prairie falcon. Annual grassland provides potential habitat for the western spadefoot, which was observed southwest of the reservoir footprint, but not within the footprint itself. Along the annual grassland/blue oak woodland edge, annual grassland provides foraging habitat for the golden eagle, long-eared owl, and white-tailed kite. The vernal pools within annual grassland provide foraging habitat for the long-billed curlew. Annual grassland also provides habitat for numerous general wildlife species. In the vicinity of Golden Gate Dam and within the potential construction disturbance area, there are two elderberry shrubs in the middle of annual grassland habitat. The permanent loss of 11,654.6 acres and the additional temporary disturbance of up to 1,000 acres of annual grassland habitat, resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodland habitat within the proposed footprint of Sites Reservoir and its dams provides nesting and foraging habitat for special-status species, such as the golden eagle, Lawrence’s goldfinch, long-eared owl, and white-tailed kite, and wintering habitat for the prairie falcon. Blue oak woodland also provides roosting and foraging habitat for the pallid bat and western red bat, as well as burrowing and foraging habitat for American badger. Blue oak woodland also provides habitat for numerous general wildlife species. The permanent loss of 353.5 acres of blue oak woodland habitat resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat within the proposed footprint of Sites Reservoir and its dams may provide habitat for many species of rodents and birds that have adapted to this annual crop, and hawks, owls, and other predators that feed on the rodents, including the northern harrier. The permanent loss of 206.9 acres of dryland grain and seed crops habitat resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine

The 20.2 acres of existing lacustrine habitat within the proposed reservoir footprint consists of man-made ephemeral stock ponds. The filling of Sites Reservoir would replace these stock ponds with more than

12,000 acres of lacustrine habitat. The new reservoir would create shoreline and shallow water habitat, as well as open water habitat. The increase in open water habitat associated with implementation of Alternative A would have a **potentially beneficial effect** on many common avian species by providing winter rafting habitat, when compared to Existing Conditions and the No Project/No Action Alternative. This habitat type could also create nesting opportunities for a few of these species (Table 14-8). In addition, the reservoir could provide foraging habitat for bats.

Table 14-8
Avian Species Expected to Benefit from an Increase in Open Water Habitat within the Sites Reservoir Inundation Area

American coot	Cinnamon teal	Great blue heron*	Northern shoveler
American white pelican	Clark's grebe	Great egret	Osprey
American wigeon	Cliff swallow*	Greater scaup	Peregrine falcon
Bald eagle*	Common goldeneye	Green-winged teal	Pied-billed grebe
Barrow's goldeneye	Common loon	Herring gull	Redhead
Blue-winged teal	Common merganser*	Hooded merganser	Ring-billed gull
Bufflehead	Double-crested cormorant	Horned grebe	Ring-necked duck
California gull	Eared grebe	Killdeer*	Rock pigeon*
Canada goose	Eurasian wigeon	Lesser scaup	Ruddy duck
Canvasback	Forster's tern	Mallard	Spotted sandpiper
Caspian tern	Gadwall	Northern pintail	Western grebe

*Potential nesting opportunity for these species.

After filling, Sites Reservoir would be operated in a way that would cause frequent and often times severe drawdowns. The fluctuation of surface water elevation could impact wildlife that use the reservoir as a drinking source, as they would have to travel farther from the cover of adjacent habitat to reach the water. This increased travel distance can increase the risk of predation, especially for small mammals, reptiles, and amphibians. However, terrestrial wildlife within the area currently does not have access to a large permanent water source. Water sources around the rim of the proposed reservoir include seasonal wetlands, ephemeral streams, and stock ponds. Most stock ponds do not have year-round water. Wildlife could continue to use these existing water sources when the reservoir is drawn down. Therefore, the fluctuations of surface water elevations during operation of Sites Reservoir associated with implementation of Alternative A would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pasture

Pasture habitat within the proposed footprint of Sites Reservoir and its dams provides potential wintering habitat for the special-status ferruginous hawk. When it is not overgrazed, pasture also provides potential habitat for ground-nesting birds and numerous general wildlife species. The permanent loss of 20.2 acres of pasture habitat resulting from construction activities and filling of the reservoir associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the footprint of Sites Reservoir and its dams provides marginal habitat for common wildlife species, including numerous non-native species. However, existing structures located within urban/disturbed habitat within the Sites Reservoir footprint provide roosting habitat for bats, including a pallid bat maternity colony observed during field surveys. The demolition of these structures would adversely affect the maternity colony if demolition occurs before young are weaned and would adversely affect all roosting bat species if they are not excluded prior to demolition.

Therefore, the permanent loss of 76.1 acres of urban/disturbed habitat resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian Habitat

Valley foothill riparian habitat within the proposed footprint of Sites Reservoir and its dams provides nesting and foraging habitat for special-status species, such as the bald eagle, long-eared owl, and yellow warbler, and provides roosting and foraging habitat for the western red bat. Valley foothill riparian also provides habitat for the western pond turtle, and potential habitat for the Swainson's hawk, which was observed adjacent to, but outside of, the footprint. When elderberry shrubs are present, valley foothill riparian provides habitat for the valley elderberry longhorn beetle. Valley foothill riparian also provides habitat for numerous general wildlife species. The permanent loss of 81.5 acres and the potential temporary disturbance of additional acreage of valley foothill riparian habitat, resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Valley Oak Woodland Habitat

Valley oak woodland habitat within the proposed footprint of Sites Reservoir and its dams has the potential to provide nesting and foraging habitat for special-status species, such as the Lewis' woodpecker, roosting and foraging habitat for the pallid bat and western red bat, and wintering habitat for the prairie falcon. Valley oak woodland provides burrowing and foraging habitat for the American badger, and potential habitat for the Swainson's hawk, which was observed in an area adjacent to the reservoir footprint, but not within the footprint. However, the valley oak woodland within the reservoir footprint represents a small isolated patch of marginal habitat. Therefore, the permanent loss of 3.4 acres of valley oak woodland habitat resulting from the construction activities and filling of the reservoir associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Bald Eagle

Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the proposed reservoir, would result in the direct and permanent loss of the valley foothill riparian habitat that is used as bald eagle nesting and foraging habitat. No nests occur within the proposed reservoir footprint, but the construction of Golden Gate Dam would result in the indirect take of an established bald eagle nest tree, which is located immediately adjacent to the footprint of the dam and within the construction disturbance area. Bald eagles tend to use the same nest for multiple years, and the nesting pair at this location has successfully reproduced in consecutive years. The disturbance or removal of this nest tree during the nesting season could result in the direct mortality of eggs or young, which would be a **significant impact**. If removed, the permanent loss of this nest tree would be a **significant impact** to bald eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

The conversion of valley foothill riparian habitat to lacustrine habitat as a result of filling of the reservoir would provide new foraging habitat and an increase in prey for bald eagles, and the lacustrine/blue oak woodland edge could provide new roosting habitat. However, during operation, recreational boating on the reservoir and its associated noise, as well as the noise and disturbance associated with campground use, could make potential nesting habitat unsuitable or result in nest abandonment. The disturbance to bald eagles caused by recreation activities would be a **potentially significant impact** to bald eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

Periodic maintenance activities, such as garbage removal, and maintenance of signs, culverts, and buoys, would not be expected to have a substantial adverse effect on bald eagles and would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Golden Eagle

Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the proposed reservoir, would result in the direct and permanent loss of annual grassland, blue oak woodland, and valley oak woodland habitat that is used by the golden eagle as nesting and foraging habitat. Golden eagles were observed foraging within the proposed reservoir footprint. This foraging habitat would be converted to lacustrine habitat, which is not suitable foraging habitat for golden eagles. Therefore, the loss of foraging habitat would be a **potentially significant impact** to golden eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

Construction activities associated with the construction of Sites Dam could disturb an active golden eagle nest located adjacent to the construction footprint in Sites Canyon. Although the location of the nest does not have a direct line of sight to the dam construction disturbance area, and although the nest is already subject to traffic noise, construction activities associated with Sites Dam could have a **potentially significant impact** on these nesting golden eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation of the dam, the portion of the road that the nest is located along would be restricted to authorized vehicles only; public vehicle access would be eliminated. Operation- and maintenance-related traffic at the dam would have a **less-than-significant impact** on these nesting golden eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Elderberry Longhorn Beetle

Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the proposed reservoir, would result in the direct and permanent loss of 672 elderberry stems. Valley elderberry longhorn beetle emergence holes were observed on 18 of the surveyed stems. Four elderberry shrubs, which were not surveyed for emergence holes, are located within the footprint of Sites Dam and would consequently experience direct loss during construction of the dam. Outside of the reservoir footprint, but within the potential construction disturbance area, two elderberry shrubs exist within the annual grassland. Emergence holes were documented on one of these shrubs. The permanent loss of these elderberry shrubs would be a **significant impact** to valley elderberry longhorn beetles, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Burrowing Owl

Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the proposed reservoir, would result in the direct and permanent loss of annual grassland and blue oak woodland habitat. Burrowing owls were observed within the reservoir footprint at the annual grassland/blue oak woodland edge. These habitat types would be converted to lacustrine habitat, which is unsuitable habitat for burrowing owls. The conversion of these habitat types to lacustrine habitat would, therefore, have a **potentially significant impact** on burrowing owls, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Pond Turtle

Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the proposed reservoir, would result in the direct and permanent loss of ponds and streams that are used by the western pond turtle. Pond turtles were observed within the reservoir footprint and at the Sites Dam site. This loss of habitat could adversely affect this species. In addition, construction activities and the subsequent filling of the reservoir could result in direct mortality to this species. During operation, the reservoir's lacustrine habitat has the potential to provide suitable pond turtle habitat along the shallow edges of the reservoir. However, the expected surface water elevation fluctuations associated with reservoir operation would reduce the potential habitat value and likely be unsuitable for this species. Therefore, the construction and operation of Sites Reservoir and Dams would have a **potentially significant impact** on western pond turtles, when compared to Existing Conditions and the No Project/No Action Alternative.

Because the reservoir's surface water elevation fluctuations would likely make the reservoir's lacustrine habitat unsuitable for pond turtles, the proposed maintenance activities (including law enforcement, garbage removal, and maintenance of signs, culverts, and buoys) would not be expected to have a substantial adverse effect on this species. Therefore, maintenance activities associated with Sites Reservoir and Dams would have a **less-than-significant impact** on western pond turtles, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion for impacts of dam construction on bald eagle nesting.

The proposed Sites Reservoir Inundation Area is used by a small resident deer herd. The herd makes small seasonal movements; it does not make large seasonal migrations to critical habitat areas. Construction activities within the reservoir footprint would not be expected to affect the movement of this herd. Construction activities at the dam sites would likely cause the herd to travel over the hillside rather than through the gap, but this change in travel route would not cause substantial interference to the herd's movements. Filling and operation of the reservoir would displace this herd into adjacent suitable habitat, and could restrict the herd's small seasonal movements. However, the deer herd would be able to travel around the rim of the reservoir, and could swim across the reservoir. Maintenance activities would not be expected to affect the movement of this herd. Therefore, the impact of interference to resident deer herd movement caused by the construction, operation, and maintenance of Sites Reservoir and Dams would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction and maintenance activities associated with the proposed Sites Reservoir and dams, as well as by recreation activities associated with reservoir operation. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Recreational use of the reservoir would include the use of watercraft such as powerboats, fishing boats, personal watercraft, and canoes. Watercrafts have been documented to adversely impact waterfowl, as they can cause disturbance of foraging and rafting activity. Boats can be a major cause of foraging disturbance for bald eagles. Human activities that are documented to cause disturbance to wildlife include power-boating and water skiing; wind surfing, rowing, and canoeing; wading and swimming; and activities along shorelines such as fishing, bird watching, and hiking. Disturbance of wildlife can result in increased energy expenditure during flight responses, displacement, and increased predation of eggs or young if nesting birds are flushed from their nests for an extended period of time. High-speed boating can also cause shoreline degradation, resulting in reduced habitat suitability for some species. Therefore, human disturbance associated with construction, maintenance, and recreation at Sites Reservoir and dams would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

The Primary Study Area is not included in any HCPs or NCCPs. The Colusa County Voluntary Oak Woodlands Management Plan provides guidelines for voluntary participation, and Project mitigation for oak woodlands would exceed those guidelines. Therefore, there would be no conflict with this plan, and consequently **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas and Associated Electrical Distribution Lines

The proposed Antelope Island, Lurline Headwaters, Stone Corral, Peninsula Hills, and Saddle Dam recreation areas all have a footprint that represents the total area within which land-based recreation could occur. However, only approximately 15 percent of each footprint would experience a permanent loss of habitat as a result of the construction of facilities, such as boat ramps, picnic areas, roads, restroom facilities, and campgrounds. The remainder of the acreage could experience impacts from activities that would occur during Project operation and maintenance, such as hiking, camping in undesignated areas, firewood collection, fuelbreak and vegetation maintenance, and off-road vehicle or mountain bike use. Three of the Recreation Areas would also have transmission lines associated with them, and the temporary construction disturbance area for the electrical distribution lines is included in addition to the recreation area footprint acreage. The total acreage of wildlife habitat within each recreation area is presented in Table 14-9.

Table 14-9
Permanent Wildlife Habitat Loss and Temporary Disturbance Due to the Construction of the Recreation Areas and Associated Electrical Distribution Lines: Alternative A

Habitat	Total Number of Acres Affected					TOTAL Disturbance	Permanent Loss[b]
	Saddle Dam[a]	Peninsula Hills[a]	Stone Corral	Antelope Island	Lurline Headwaters[a]		
Annual grassland	271.6	78.2	132.8	12.3	79.2	**574.1**	**86.1**
Blue oak woodland	0	301.3	102.3	36.9	156.2	**596.7**	**89.2**
Chamise-redshank chapparal	0	0			1.0	**1.0**	**0.2**
Lacustrine	1.2	0	0	0	0[c]	**1.2**	**0.2**
TOTAL	**272.8**	**379.5**	**235.1**	**49.2**	**236.4**	**1,173.0**	**175.7**

[a]Acreage includes construction disturbance area for associated electrical distribution line.
[b] Permanent loss is calculated as 15 percent of the total construction disturbance area.
[c]This facility has a small amount of lacustrine habitat, but the total amount is less than 0.1 acre.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland habitat within the proposed footprint of each of the Recreation Areas does not contain vernal pools, but otherwise has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. However, the Saddle Dam Recreation Area contains seasonal wetlands that are considered to be part of the annual grassland habitat. The special-status long-billed curlew and tri-colored blackbird were observed using this habitat, and foraging golden eagles were observed. The potential disturbance of up to 574.1 acres and permanent loss of approximately 86 acres of annual grassland habitat resulting from construction and the recreation activities associated with the operation of the Alternative A Recreation Areas would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodland habitat within the proposed footprint of four of the five Recreation Areas has similar value to wildlife as described in the impact assessment for Sites Reservoir and Dams, although portions of the blue oak woodland on Antelope Island and Lurline Headwaters have an understory of mixed chaparral. The special-status American badger and golden eagle were observed within this habitat. The potential disturbance of up to 596.7 acres and permanent loss of approximately 89 acres of blue oak woodland habitat resulting from construction and the recreation activities associated with operation of the Alternative A Recreation Areas would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Chamise-Redshank Chaparral

Chamise-redshank chaparral habitat is located within the construction disturbance area associated with the proposed Lurline Headwaters Recreation Area. This chaparral provides potential habitat for Bell's sage sparrow, which was observed west of the Sites Reservoir footprint. The construction disturbance area represents an area of potential temporary disturbance that would be returned to chaparral habitat after completion of the Project. Because of the above-ground nature of transmission line construction, impacts to this habitat could be avoided. The potential disturbance of up to 1.0 acre of chamise-redshank chaparral habitat resulting from transmission line construction activities associated with implementation of the Alternative A Recreation Areas would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine Habitat

The lacustrine habitat within the proposed footprint of two of the Recreation Areas is made up of man-made ephemeral stock ponds. The three ponds that exist within the footprint of the Saddle Dam Recreation Area are not located within an area designated for construction, but are spread out through the center of the recreation area footprint and could be subject to disturbance from recreation activities. The one pond that exists within the footprint of the Lurline Headwaters Recreation Area is located at the north edge of the recreation area footprint and is not located within an area designated for construction. The potential disturbance to the 1.2 acres of stock ponds could adversely impact terrestrial wildlife.

However, the inundation area of Sites Reservoir would be located immediately adjacent to these Recreation Areas, and implementation of Alternative A would provide over 12,000 acres of lacustrine habitat, including shoreline, shallow water, and open water habitat. The increase in adjacent lacustrine habitat could benefit the wildlife species that use these stock ponds. Therefore, the potential disturbance to these stock ponds resulting from recreation activities associated with operation of the Alternative A Recreation Areas would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Golden Eagle

The construction-related ground-disturbing activities, and the associated recreation activities that would occur during operation in the proposed Recreation Areas, would result in the direct and permanent loss or disturbance of annual grassland and blue oak woodland habitat that is used by golden eagles as nesting and foraging habitat. Golden eagles were observed foraging at the proposed Recreation Areas year round, and were observed nesting at Stone Corral, Lurline Headwaters, and Peninsula Hills recreation areas. The permanent loss or disturbance of annual grassland and blue oak woodland habitat resulting from construction and operation of the Recreation Areas would be a **significant impact** to golden eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

Nest tree removal during construction, and the potential disturbance to nesting golden eagles from recreation activities that would occur during Project operation, or from maintenance activities, could cause nest abandonment or direct mortality to eggs or young, and therefore, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion for the impacts of the Recreation Areas on nesting golden eagles.

Limited construction would occur within the proposed footprint of each recreation area. Permanent structures could include vault toilets, picnic tables, and boat ramps. Portions of the existing vegetation within the Recreation Areas could be cleared to provide hiking trails, campsites, and gravel parking areas. After construction is complete, it is possible that larger areas of disturbance, such as gravel parking lots or multiple-site campgrounds, could interfere with the movement of small mammals, reptiles, or amphibians due to the lack of vegetative cover. However, the surrounding native habitat would be preserved, and vegetation would be planted and maintained around these disturbed areas. These disturbed areas would not be expected to substantially interfere with the movement of resident wildlife species because those species would be able to travel around the areas of disturbance. Therefore, construction, operation, and maintenance of the Recreation Areas would have a **less-than-significant impact** on the movement of small mammals, reptiles, and amphibians, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, maintenance, and recreation activities associated with the proposed Recreation Areas. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Maintenance activities on roads, trails, and parking lots could involve grading or vegetation removal, which would involve the use of heavy equipment and cause increased disturbance from noise. Maintenance of the vault toilets would require large and noisy pumping trucks. Land-based recreation activities that occur outside of designated camping areas, hiking trails, or roads cause ground disturbance that could result in the loss of native vegetation and promote the establishment of non-native plant species, which can alter habitat suitability. The non-native landscaping that would be planted around campsites and parking areas, and the associated vegetation maintenance and weed control, including the potential use of herbicides, would alter habitat suitability. Recreational activity would result in the accumulation of garbage, which attracts non-native wildlife species and can increase human-wildlife conflicts. The availability of additional food can change the composition and population dynamics of native species, as more species such as raccoons, skunks, crows, and rodents would be attracted to the Recreation Areas. Reptiles and amphibians in and around the Recreation Areas could experience increased injury or mortality as a result of handling by humans. Unleashed dogs can also disturb, injure, or kill wildlife by flushing, chasing, or attacking. Dogs also have the potential to spread disease or parasites to other wildlife. Artificial nighttime lighting at the Recreation Areas could cause resident wildlife to avoid the area, and could adversely affect reptiles and amphibians that breed and forage nocturnally. Wildlife viewing and photography can disturb wildlife as a result of frequent encounters of a long duration and attempts to approach wildlife. The increased noise from human activity could disturb the special-status species that are found within the Recreation Areas, and could, for example, lead to golden eagle nest abandonment and the incidental loss of fertile eggs or young. The human disturbance associated with the construction, maintenance, and recreational use during Project operation of the Recreation Areas would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Road Relocations and South Bridge

Construction of the proposed road relocations would require a 100-foot-wide buffer on each side of the road, measured from the roadway centerline, which would result in the temporary disturbance of wildlife habitat. Disturbed areas would be restored to their original habitat type after construction is completed. The roads would be fenced on both sides, as most are now. The affected habitat types and total acreage impacted for each habitat type are listed in Table 14-10. Acreage for the proposed South Bridge is not included in this analysis because the bridge’s on-the-ground footprint (i.e., bridge piers) and its onstruction disturbance area would be within the footprint of Sites Reservoir; the acreage is, therefore, already accounted for in the permanent loss of habitat associated with the proposed reservoir.

Table 14-10
Permanent Wildlife Habitat Loss and Temporary Disturbance Due to the Construction of the Road Relocations and South Bridge: Alternative A

Habitat	Total Number of Acres Affected	Permanent Loss* (Acres)
Annual grassland	719.9	216.0
Blue oak woodland	195.8	58.7
Canal	0.6	0.2
Chamise-redshank chaparral	1.5	0.4
Dryland grain and seed crops	15.9	4.8
Lacustrine	0.5	0.2
Mixed chaparral	2.6	0.8
Urban/disturbed	9.7	2.9
Valley foothill riparian	4.2	1.3
TOTAL	**950.7**	**285.3**

*Permanent loss is calculated as 30 percent of the total construction disturbance area.

The permanent loss of wildlife habitat resulting from the proposed footprint of the roads and the required cut and fill would be approximately 285 acres. The majority of the habitat acreage affected by construction of the roads would be annual grassland habitat and blue oak woodland habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The special-status long-billed curlew, prairie falcon, tri-colored blackbird, white-tailed kite, American badger, and pallid bat were observed within this habitat along the North Road and/or Southeast Road. The loggerhead shrike, white-tailed kite, golden eagle, northern harrier, tri-colored blackbird, and long-billed curlew were observed within this habitat type along the Eastside Road. The temporary disturbance of 719.9 acres, of which up to 285 acres could represent a permanent loss, of annual grassland habitat resulting from road construction activities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Blue Oak Woodland

Blue oak woodland habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The special-status Lewis' woodpecker, western red bat, and American badger were observed in this habitat along the North and/or Southeast Road. The temporary disturbance of 195.8 acres, all of which could represent a permanent loss, of blue oak woodland habitat resulting from road construction activities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Canal

The construction of a bridge would be required where the proposed footprint and construction disturbance area of the road relocations would cross existing canals. Because no loss of canal habitat or disturbance of the main channel of any canal would occur as a result of road construction associated with implementation of Alternative A, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Chamise-Redshank Chaparral

Chamise-redshank chaparral habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for the Recreation Areas. The temporary disturbance of 1.5 acres or potential permanent loss of chamise-redshank chaparral habitat, resulting from road construction activities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The special-status Swainson's hawk was observed foraging, and sandhill cranes were observed flying, over this habitat type along the Southeast Road. The temporary disturbance of 15.9 acres or potential permanent loss of dryland grain and seed crops habitat, resulting from road construction activities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine

The lacustrine habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for the Recreation Areas. The construction disturbance areas for Lurline Road and Com Road converge east of the Lurline Headwaters Recreation Area. At the point of convergence, the disturbance areas overlap with a pond that is located within blue oak woodland habitat. Several other stock ponds are located adjacent to, but outside of, the construction disturbance area of other road segments. The temporary disturbance of up to 0.5 acre of lacustrine habitat resulting from road construction activities associated with implementation of Alternative A would not be expected to adversely affect wildlife, and would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Mixed Chaparral

The mixed chaparral habitat within the proposed footprint and construction disturbance area of the road relocations has the potential to support numerous species of terrestrial wildlife, including Bell's sage sparrow, which was observed west of the Sites Reservoir footprint along a formerly proposed road route. The temporary disturbance of 2.6 acres or potential permanent loss of mixed chaparral habitat, resulting from road construction activities associated with implementation of Alternative A, would have a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. Although construction of the proposed South Bridge could provide roosting habitat for bats if niches are incorporated into the design, construction of the proposed roads could require the demolition of a few existing structures that may provide roosting habitat for bats. Therefore, the temporary disturbance of 9.7 acres or potential permanent loss of urban/disturbed habitat, resulting from road construction activities associated with implementation of Alternative A, would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian

Valley foothill riparian habitat within the proposed footprint and construction disturbance area of the road relocations has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The special-status western pond turtle was observed within this habitat type along Stone Corral Creek. The temporary disturbance of 4.2 acres or potential permanent loss of valley foothill riparian habitat, resulting from road construction activities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Valley Elderberry Longhorn Beetle

There are more than 60 elderberry shrubs along Stone Corral Creek within 100 feet of Maxwell Sites Road, located approximately 0.5 to 0.75 mile northwest from the road's intersection with the proposed Eastside Road. There is also one shrub within 100 feet of the road located approximately 0.5 mile southeast of the same intersection. Although construction would not occur on Maxwell Sites Road, construction vehicles and equipment would use this road. The expected increase in recreational visitors to the area would also increase the use of this road. Traffic associated with maintenance activities is expected to be minimal, resulting in a **less-than-significant impact** on elderberry shrubs, when compared to Existing Conditions and the No Project/No Action Alternative.

The increase in construction and recreation traffic associated with construction and operation of Alternative A has the potential to adversely affect these elderberry shrubs by increasing the amount of dust in the area. Increased dust would have a **potentially significant impact** on elderberry shrubs, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Burrowing Owl

Construction-related ground-disturbing activities associated with the proposed road relocations would result in the permanent loss and temporary disturbance of annual grassland habitat. Burrowing owls were observed along the proposed North Road and Eastside Road in the vicinity of road cuts. Due to their proximity to the road, vehicle collisions with this species could increase due to increased recreation and maintenance traffic on existing and proposed new roads. The loss of annual grassland habitat during Project construction, as well as the increased traffic associated with operation and maintenance activities resulting from implementation of Alternative A, would be a **potentially significant impact** to burrowing owls, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion for the potential impact of roads on western burrowing owl movement.

In addition, construction of new roads can result in habitat fragmentation or reduced habitat connectivity. Improvement (such as from gravel to asphalt) or widening of existing roads can make it more difficult for small mammals, reptiles, or amphibians to cross them. However, each of the proposed new roads would be two-lane roads that, combined with their shoulders, are only approximately 60 feet wide. The roads would, therefore, not be expected to prohibit wildlife movement. Roadside fencing can also restrict wildlife movement. However, the fencing along existing roads and fencing that would be constructed along new roads consist of barbed wire fencing that does not obstruct the movement of these wildlife species. Construction of the roads associated with implementation of Alternative A would, therefore, have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Increased traffic associated with the operation and maintenance of the roads could result in increased mortality for individual wildlife species traveling across or basking on the roads. However, the mortality rate would not be expected to increase to a level that would adversely affect local populations. Therefore, the increased traffic associated with the operation and maintenance of the roads would have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of the roads and bridge. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting.

Road maintenance could include grading, vegetation removal, railing repairs, and repaving. Bridge maintenance activities could include safety inspections, redecking, and repainting. Many of these activities involve the use of heavy equipment and cause increased disturbance from noise. Depending on design, the completed bridge has the potential to support nesting birds and roosting bats, including the special-status pallid bat. Maintenance activities on the bridge have the potential to adversely affect these species, especially if it is conducted during the breeding season.

During Project operation, the bridge and portions of the roads would have permanent nighttime safety lighting. Bridge and road lighting could cause resident wildlife to avoid the area, and could adversely affect nocturnal wildlife such as bats, owls, and frogs. Project operation would result in increased traffic on the roads, as well as on the bridge in a location where traffic does not currently travel. Increased traffic could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Human disturbance associated with construction, operation, and maintenance of the South Bridge and roads would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

The construction of the proposed Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard would require ground-disturbing activities that would result in the direct and permanent loss of wildlife habitats (Table 14-11).

Table 14-11
Acres of Wildlife Habitat Subject to Direct and Permanent Habitat Loss from Construction of the Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard: Alternative A

Habitat	Permanent Loss (Acres)
Annual grassland	81.6
Lacustrine	0.2
Urban/disturbed	4.3
Valley foothill riparian	3.1
TOTAL	**89.2**

Additional acreage of temporary disturbance (9 acres) would occur as a result of a construction disturbance area for these proposed facilities. Disturbed areas would be restored to their original habitat type after construction is complete. The majority of wildlife habitat affected by these facilities and their construction disturbance areas would be annual grassland habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland within the proposed footprint of each of these facilities has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The permanent loss of 81.6 acres and the potential temporary disturbance of an additional 9 acres of annual grassland habitat, resulting from the construction of these facilities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine

The lacustrine habitat that is located within the proposed footprint of the Sites Reservoir Inlet/Outlet Structure consists of a man-made ephemeral stock pond. However, the existing Funks Reservoir is located adjacent to this structure and provides over to 220 acres of lacustrine habitat, including shoreline, shallow water, and open water habitat. Therefore, the loss of 0.2 acre of lacustrine habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the proposed footprint of these facilities (i.e., Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard) has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. Construction of the proposed outlet structure would require the demolition of a few existing structures that may provide roosting habitat for bats. Therefore, the permanent loss of 4.3 acres of urban/disturbed habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian

Valley foothill riparian habitat within the proposed footprint of these facilities (i.e., Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard) has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams, with the exception of elderberry shrubs, which are not present within the footprint of any of these facilities. The permanent loss of 3.1 acres of valley foothill riparian habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No special-status species were observed within the vicinity of the proposed footprint of the Sites Reservoir Inlet/Outlet Structure or associated facilities. Therefore, construction, operation, and maintenance activities associated with implementation of Alternative A in this area would be expected to have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

It is possible that the construction and operation of these proposed facilities could interfere with the movement of small mammals, reptiles, or amphibians. However, more than 90 percent of the disturbance would occur in annual grassland habitat, and the surrounding grassland habitat would be preserved. These facilities would not be expected to substantially interfere with the movement of resident wildlife species because those species would be able to travel around the areas of disturbance. Maintenance activities, including vehicle access to these facilities, would not be expected to substantially interfere with wildlife movement. Therefore, construction, operation, and maintenance of these facilities associated with implementation of Alternative A would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of these facilities. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require frequent vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Pump operation could result in increased noise levels that may adversely affect wildlife. Therefore, the human disturbance associated with construction, operation, and maintenance of these facilities resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The proposed footprint for the tunnel from the Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure would be drilled and would not have any above-ground disturbance associated with it. Staging areas would occur at either end of the tunnel within the construction footprint of the Sites Pumping/Generating Plant and the Sites Reservoir Inlet/Outlet Structure. These staging areas are addressed in the impact analysis for those facilities. The tunnel would be operated remotely, and maintenance activities would not occur above ground. Therefore, construction, operation, and maintenance of the tunnel would have **no impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No special-status species were observed within the vicinity of the proposed construction footprint of the tunnel. Because no above-ground disturbance would occur during construction, operation would occur remotely, and maintenance activities would not occur above ground, these activities associated with the tunnel would be expected to have **no impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction and maintenance of the tunnel and inlet/outlet structure. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Therefore, the human disturbance associated with the construction, operation, and maintenance of these facilities resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The construction of the Holthouse Reservoir Complex would require the dredging of Funks Reservoir. The existing Funks Reservoir provides up to 228 acres of lacustrine habitat and more than three miles of associated shoreline. The reservoir would be drained for approximately two years, with construction activities occurring during months other than November through April.

Construction of the rest of the proposed Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would result in the direct and permanent loss of the following wildlife habitats, with the exception of the Holthouse to T-C Canal Pipeline, which would result in the temporary disturbance of wildlife habitat (Table 14-12).

Table 14-12
Permanent Wildlife Habitat Loss and Temporary Disturbance Due to the Construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard: Alternative A

Habitat	Temporary Disturbance[a] (Acres)	Permanent Loss (Acres)
Annual grassland	9.7	112.7
Canal	0.4	7.3
Dryland grain and seed crops	0	60.5
Fresh Emergent Wetland[b]	0	0.5
Irrigated row and field crops	14.2	151.8
Urban/disturbed	0	0.6
Valley foothill riparian	0	7.0
TOTAL	**24.3**	**340.4**

[a]Acreage represents temporary disturbance associated with the defined construction disturbance area of the Holthouse to T-C Canal Pipeline.

[b]Fresh Emergent Wetland includes alkaline wetland.

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these proposed facilities. The construction disturbance areas for the Delevan Transmission Line and the Delevan and TRR pipelines are located adjacent to the footprint of these facilities. The construction disturbance area acreage for the Holthouse Reservoir Complex would be approximately 36 acres in size, but could overlap with the pipeline disturbance area. Disturbed areas would be restored to their original habitat type after construction is complete. The majority of wildlife habitat affected by these facilities and their construction disturbance area would be irrigated row and field crops, followed by annual grassland and dryland grain and seed crops habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland within the footprint of the proposed Holthouse Reservoir facilities has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. Northern harriers and white-tailed kites were observed foraging over this habitat within the footprint of the reservoir. The permanent loss of 112.7 acres and the potential additional temporary disturbance of annual grassland habitat, resulting from the construction of these facilities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Canal

Canal habitat within the proposed footprint of the Holthouse Reservoir facilities consists of a portion of the existing concrete-lined T-C Canal. Wildlife species observed using this habitat within the construction footprint include the double-crested cormorant, mallard, and river otter. Killdeer are usually present along the canal’s levee. A portion of the canal would be relocated, and the previous location would be converted to lacustrine habitat. The conversion of 7.3 acres of canal habitat to lacustrine habitat resulting from the construction of these facilities and the filling of the reservoir associated with implementation of

Alternative A would be a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat within the proposed footprint of the Holthouse Reservoir facilities has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The permanent loss of 60.5 acres and the potential additional temporary disturbance of dryland grain and seed crops habitat, resulting from the construction of these facilities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Fresh Emergent Wetland

The fresh emergent wetland wildlife habitat within the Holthouse Reservoir Complex footprint is represented by an alkaline wetland swale within the annual grassland. This wetland habitat has the potential to support numerous species of wildlife. Construction of the Holthouse Reservoir Complex would result in the permanent loss of 0.5 acre of this habitat type, and could result in the disruption of the water supply to this alkaline wetland. Therefore, the permanent loss of up to 0.5 acre of fresh emergent wetland habitat, and the potential disruption of its hydrology, resulting from construction of the Holthouse Reservoir Complex, would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Irrigated Row and Field Crops

Irrigated row and field crops habitat within the proposed footprint of the Holthouse Reservoir facilities provides foraging habitat for the northern harrier. The permanent loss of 151.8 acres, and the potential additional temporary disturbance of irrigated row and field crops habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine

The existing Funks Reservoir is used extensively by many water-dependent species of waterfowl and shorebirds, including the American bittern, American coot, black-necked stilt, canvasback, double-crested cormorant, great blue heron, killdeer, northern shoveler, wood duck, and five species of grebes. The projected two-year absence of lacustrine habitat and associated shoreline habitat at the reservoir during Project construction would eliminate habitat that has been available to these water-dependent avian species since 1976. However, the reservoir would be drained during the non-breeding season, and nearby East Park, Stony Gorge, and Indian Valley reservoirs, the Delevan and Sacramento NWRs, and the adjacent rice fields could be used during the period of construction. The lacustrine habitat would be restored after construction is complete. Therefore, Funks Reservoir dredging associated with implementation of Alternative A would have a **less-than-significant impact** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat that is located within the proposed footprint of the Holthouse Reservoir facilities consists of the existing Funks Dam maintenance road. The gravel road provides little habitat value for wildlife. Therefore, the permanent loss of 0.6 acre of urban/disturbed habitat resulting from the construction of the Holthouse Reservoir Complex associated with implementation of Alternative A would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian

Valley foothill riparian habitat within the proposed footprint of the Holthouse Reservoir facilities has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams, with the exception of elderberry shrubs, which are not present within the footprint of this complex of facilities. Nesting great horned owls and red-tailed hawks were observed in this habitat within the footprint of the reservoir. The permanent loss of 7.0 acres of valley foothill riparian habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The existing Funks Reservoir is used by the special-status American white pelican, common loon, and long-billed curlew. The projected two-year absence of lacustrine habitat and associated shoreline habitat at the reservoir during Project construction would eliminate habitat that has been available to these water-dependent avian species since 1976. However, nearby East Park, Stony Gorge, and Indian Valley reservoirs could be used during the period of maintenance, and the lacustrine habitat would be restored after construction is complete. Operation and maintenance impacts would be expected to be the same as for the existing Funks Reservoir. Therefore, Funks Reservoir dredging associated with implementation of Alternative A would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Pond Turtle

Western pond turtles were observed downstream of Funks Reservoir along Funks Creek in an area that would be within the proposed footprint of the Holthouse Reservoir Complex. Construction activities and the subsequent filling of the reservoir would result in habitat loss and could result in direct mortality of this species. Therefore, construction activities and inundation associated with the Holthouse Reservoir Complex resulting from implementation of Alternative A would have a **potentially significant** impact on western pond turtles, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation of the reservoir, releases would be made downstream to the remaining Funks Creek channel to maintain flows. Operation and maintenance impacts would be expected to the same as for the existing Funks Reservoir. Therefore, operation and maintenance of the Holthouse Reservoir Complex would have a **less-than-significant impact** on the western pond turtle, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The existing Funks Reservoir is used by a few pair of nesting western grebes annually. The projected two-year absence of lacustrine habitat and associated shoreline habitat at the reservoir during construction would eliminate habitat that has been available to these water-dependent grebes since 1976. However, the reservoir would be drained during the non-breeding season and nearby East Park, Stony Gorge, and Indian Valley reservoirs could be used during the period of construction. The lacustrine habitat would be restored after construction is complete. Therefore, Funks Reservoir dredging associated with implementation of Alternative A would have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

After Project construction is complete, it is possible that larger areas of disturbance associated with the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard could interfere with the movement of small mammals, reptiles, or amphibians. However, almost 80 percent of the disturbance would occur in annual grassland habitat and irrigated row and field crops. The surrounding grassland and field crop habitat would be preserved. The reservoir complex would not be expected to substantially interfere with the movement of resident wildlife species because those species would be able to travel around the areas of disturbance. Therefore, construction, operation, and maintenance of these facilities associated with implementation of Alternative A would have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Additionally, filling Holthouse Reservoir would effectively enlarge the surface area of Funks Reservoir. If emergent vegetation is present, the larger reservoir size and increased availability of shallow water habitat could benefit the western grebes that already nest at Funks Reservoir. This potential increase in available nesting habitat associated with implementation of Alternative A would have a potentially **beneficial effect** on nesting western grebes, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of the proposed Holthouse Reservoir Complex. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require frequent vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Therefore, the human disturbance associated with construction, operation, and maintenance of the Holthouse Reservoir Complex resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Proposed modifications to the existing GCID Canal Facilities would require associated construction disturbance areas that would create a temporary disturbance to wildlife habitats (Table 14-13).

Table 14-13
Temporary Disturbance of Wildlife Habitat Due to Modifications of the Glenn-Colusa Irrigation District Canal Facilities: Alternative A

Habitat	Temporary Disturbance (Acres)
Canal (existing GCID Canal)	3.1
Urban/disturbed	1.6
TOTAL	**4.7**

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Canal

Canal habitat within the proposed construction disturbance area of the GCID Canal Facilities Modifications consists of a portion of the existing GCID Canal. The canal would be dewatered to line 200 feet of it, so the open water portion of that section would be lost during construction. However, construction would occur during the annual maintenance period when the canal is already dewatered. Therefore, the temporary disturbance of approximately three acres of canal habitat resulting from canal modifications associated with implementation of Alternative A would be a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat that is located within the proposed construction disturbance area of the GCID Canal Facilities Modifications consists of roads and a railroad, which provide little habitat value for wildlife. Therefore, the temporary disturbance of almost two acres of urban/disturbed habitat resulting from the canal modifications associated with implementation of Alternative A would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Giant Garter Snake

Areas of giant garter snake habitat exist within 200 feet of the GCID Canal. Proposed construction activities have the potential to disturb giant garter snakes or cause direct mortality from excavation of hibernating snakes if work is conducted from October 1 through May 1. Construction activities associated with modification of the GCID Canal resulting from implementation of Alternative A would, therefore, have a **potentially significant impact** on the giant garter snake, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Proposed canal modifications would occur within the existing canal or siphon locations and would have small associated construction disturbance areas for a temporary period of time. After construction is complete, the areas would be returned to their original condition. Because construction activities would occur along a maintained canal and at a railroad track siphon, where disturbance is frequent, modifications to these facilities associated with implementation of Alternative A would be expected to have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by the proposed construction activities associated with GCID Canal Modifications. Increased vehicle traffic associated with the transportation of personnel and materials to the site, as well as the noise associated with construction equipment and personnel, could cause temporary disturbance to wildlife. Therefore, the human disturbance associated with construction activities at the GCID Canal modifications resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Construction of the proposed TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and GCID Canal Connection to the TRR facilities would require ground-disturbing activities that would result in the direct and permanent loss of wildlife habitats (Table 14-14).

Table 14-14
Permanent Wildlife Habitat Loss and Temporary Disturbance Due to the Construction of the Terminal Regulating Reservoir Facilities: Alternative A

Habitat	Temporary Disturbance* (Acres)	Permanent Loss (Acres)
Canal	0	0.9
Deciduous orchard	0	0.6
Dryland grain and seed crops	0	60.8
Pasture	0	11.7
Rice	13.6	120.9
Urban/disturbed	0.8	
TOTAL	**14.4**	**194.9**

*Acreage represents temporary disturbance associated with the defined construction disturbance area of the TRR to Funks Creek Pipeline.

Additional temporary disturbance of wildlife habitat would occur as a result of a construction disturbance area for these facilities. Construction disturbance associated with the proposed TRR to Funks Creek Pipeline would also be temporary. Two sides of the proposed reservoir would be surrounded by the construction disturbance area for the Delevan and TRR pipelines, which overlaps with the footprint of the reservoir. The construction disturbance area acreage would be approximately 19 acres in size, but could overlap with the pipeline disturbance area. Disturbed areas would be restored to their original habitat type after construction is complete. The majority of wildlife habitat affected by these facilities is rice habitat, followed by dryland grain and seed crops.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Canal

The existing GCID Canal is within the proposed footprint of the bay associated with the GCID Canal Connection to the TRR. The canal would still exist upstream and downstream of this bay, and the portion of the canal that would be within the proposed footprint of the connection would be expanded during the annual maintenance period for the canal when the canal is dewatered. This modification of the canal associated with implementation of Alternative A would not be expected to adversely affect wildlife, and therefore, would have a **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Deciduous Orchard

Deciduous orchards are used by numerous wildlife species. It is possible that the permanent loss of 0.6 acre of deciduous orchard habitat resulting from the construction of the TRR facilities could be avoided by revising the siting of the facilities. Due to the small amount of acreage that could be lost, and due to the possibility of avoiding this loss, the potential loss of deciduous orchard associated with construction of the TRR facilities would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat within the proposed footprint of these facilities has the same habitat value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The permanent loss of 60.8 acres and the potential additional temporary disturbance of dryland grain and seed crops, resulting from the construction of these facilities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pasture

Pasture habitat within the proposed footprint of these facilities has the same habitat value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The permanent loss of 11.7 acres of pasture habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Rice

Rice habitat, especially when flooded, supports numerous species of wildlife. The special-status sandhill crane, black tern, Caspian tern, long-billed curlew, yellow-headed blackbird, long-eared owl, short-eared owl, and white-tailed kite were observed using this habitat within or adjacent to the proposed footprint of these facilities. The permanent loss of 120.9 acres and the potential additional temporary disturbance of rice habitat, resulting from the construction of these facilities associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the proposed footprint of these facilities consists of maintenance roads. These roads provide little habitat value for wildlife. Therefore, the temporary disturbance of 0.8 acre of urban/disturbed habitat resulting from the construction of these facilities associated with implementation of Alternative A would be a **less than significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No special-status species were observed within the vicinity of the proposed construction footprint of the TRR or associated facilities. Therefore, construction, operation, and maintenance activities associated with these facilities resulting from implementation of Alternative A would be expected to have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

After construction is complete, it is possible that larger areas of disturbance associated with these proposed facilities could interfere with the movement of small mammals, reptiles, or amphibians. However, all of the disturbance would occur in agricultural, urban/disturbed, or canal habitat. The surrounding area that includes these habitats would be preserved. These facilities would not be expected to substantially interfere with the movement of resident wildlife species because those species would be able to travel around the areas of disturbance. Therefore, construction, operation, and maintenance of these facilities associated with implementation of Alternative A would have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of these facilities. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Pump operation could result in increased noise levels that may adversely affect wildlife. Therefore, the human disturbance associated with construction, operation, and maintenance of these facilities resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

The proposed TRR Pipeline would be aligned parallel and adjacent to the western 3.5 miles of the proposed Delevan Pipeline, and would be completely within the construction disturbance area of the Delevan Pipeline. The TRR Pipeline Road would be located atop the length of the TRR Pipeline, and the Delevan Pipeline Electrical Switchyard would be located where the Delevan Pipeline would cross the existing PG&E transmission line. The construction of the pipelines would require ground-disturbing activities that would result in the temporary disturbance of wildlife habitats that would be restored to their original habitat type after construction is complete. The construction of the TRR Pipeline Road and Delevan Pipeline Electrical Switchyard would require ground-disturbing activities that would result in permanent habitat loss (Table 14-15).

Table 14-15
Permanent Wildlife Habitat Loss and Temporary Disturbance Due to the Construction of the Delevan and Terminal Regulating Reservoir Pipelines, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard: Alternative A

Habitat	Temporary Disturbance (Acres)	Permanent Loss (Acres)
Barren*	20.9	0.2
Canal	8.2	0.1
Deciduous orchard	173.2	3.7
Dryland grain and seed crops	190.1	0.2
Eucalyptus	46.2	0
Fresh emergent wetland	18.5	0
Irrigated row and field crops	196.3	3.8
Lacustrine	5.1	0
Pasture	240.0	0
Rice	1,358.9	0.3
Urban/disturbed	36.8	0
TOTAL	**2,294.2**	**8.3**

*Barren habitat includes fallowed agricultural fields

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Barren

Barren habitat within the construction disturbance area of the proposed Delevan and TRR pipelines consists of fallowed agricultural fields. The only special-status species that has the potential to use this type of barren habitat is the wintering mountain plover. This species was not observed within any of the Project facility sites, but is known to occur in southeast Colusa County. Depending on the time of year and duration of construction activities, the temporary disturbance of 20.9 acres of barren habitat and permanent loss of 0.2 acre resulting from construction of the Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Canal

The canal habitat within the construction disturbance area of the proposed Delevan and TRR pipelines is represented by the locations where the Delevan Pipeline would cross the GCID Canal and the CBD. The special-status American white pelican and yellow warbler were observed at the CBD.

At the GCID Canal crossing location, construction would include tunneling below the canal without disturbing the existing infrastructure. Because no loss of canal habitat would occur as a result of pipeline construction associated with implementation of Alternative A, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

At the CBD crossing location, construction would occur after the irrigation season ends and before winter rains begin. Construction would be staged at this crossing and would occur within half of the channel while an installed cofferdam bypasses flows on the other half of the channel. The temporary disturbance of the CBD would be short-term, would affect a small area of the CBD, and would not disrupt upstream and downstream passage or use of adjacent areas. Therefore, pipeline construction associated with implementation of Alternative A would have a **less-than-significant impact** on the CBD, when compared to Existing Conditions and the No Project/No Action Alternative.

Deciduous Orchard

Deciduous orchard habitat within the construction disturbance area of the proposed Delevan and TRR pipelines consists of almond trees. The temporary disturbance of 173.2 acres and permanent loss of 3.7 acres of deciduous orchard habitat resulting from the construction of the Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops habitat within the construction disturbance area of the proposed Delevan and TRR pipelines has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The temporary disturbance of 190.1 acres and permanent loss of 0.2 acre of dryland grain and seed crops habitat resulting from the construction of the Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Eucalyptus

The eucalyptus habitat within the construction disturbance area of the proposed Delevan and TRR pipelines is located along the sides of an unlined irrigation canal, and consequently functions in a capacity similar to riparian habitat for many wildlife species. Eucalyptus habitat provides roosts, perches, and nest sites for numerous bird species, including raptors. The temporary disturbance of 46.2 acres of Eucalyptus habitat resulting from the construction of the Delevan and TRR pipelines associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Fresh Emergent Wetland

The fresh emergent wetland habitat within the construction disturbance area of the proposed Delevan and TRR pipelines, which includes alkaline wetlands, has the potential to support numerous species of wildlife, including the special-status giant garter snake, sandhill crane, black tern, northern harrier, short-eared owl, tri-colored blackbird, white-tailed kite, and yellow-headed blackbird. All of these species were observed along the pipeline disturbance area in adjacent habitat types. The temporary disturbance of 18.5 acres of fresh emergent wetland habitat resulting from the construction of the Delevan and TRR pipelines associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Irrigated Row and Field Crops

Irrigated row and field crops habitat within the construction disturbance area of the proposed Delevan and TRR pipelines has the same value to wildlife as described in the impact assessment for the Holthouse Reservoir Complex. The temporary disturbance of 196.3 acres and permanent loss of 3.8 acres of irrigated row and field crops habitat resulting from the construction of the Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Lacustrine

The lacustrine habitat within the construction disturbance area of the proposed Delevan and TRR pipelines represents a large pond, which has the same value to wildlife as described in the impact assessment for lacustrine habitat within the Recreation Areas. This pond is located in proximity to the fresh emergent wetlands of the adjacent Delevan NWR, and therefore, may provide habitat for numerous wildlife species. The temporary disturbance of 5.1 acres of lacustrine habitat resulting from pipeline construction activities associated with implementation of Alternative A would have a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pasture

Pasture habitat within the construction disturbance area of the proposed Delevan and TRR pipelines has the same habitat value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The special-status golden eagle and prairie falcon were observed within this habitat type along the pipeline disturbance area. The temporary disturbance of 240.0 acres of pasture habitat resulting from pipeline construction activities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Rice

Rice habitat within the construction disturbance area of the proposed Delevan and TRR pipelines has the same value to wildlife as described in the impact assessment for the TRR, TRR Pumping/Generating Plant, and GCID Canal Connection to the TRR. The special-status western pond turtle was observed along an irrigation canal associated with rice habitat. The black tern, long-billed curlew, Caspian tern, sandhill crane, long-eared owl, short-eared owl, white-tailed kite, and yellow-headed blackbird were observed in rice fields or adjacent habitats within this construction disturbance area. The temporary disturbance of 1,358.9 acres and permanent loss of 0.3 acre of rice habitat resulting from pipeline, road, and electrical switchyard construction activities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the construction disturbance area of the proposed Delevan and TRR pipelines consists of roads and several structures. The structures would not be demolished, and the roads provide little habitat value for wildlife. Therefore, the permanent loss of 36.8 acres of urban/disturbed habitat resulting from pipeline construction activities associated with implementation of Alternative A would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Bank Swallow

Construction of the proposed Delevan and TRR pipelines would require the creation of trenches that would have steep cut banks made of sandy loam soils. Due to the proximity of the trench to the Sacramento River and to known breeding populations of bank swallows, the banks of the trenches could attract nesting bank swallows. Nesting bank swallows within the construction area would be at high risk of injury or death. Therefore, the construction of the pipelines associated with implementation of Alternative A could have a **potentially significant impact** on bank swallows, when compared to Existing Conditions and the No Project/No Action Alternative.

Giant Garter Snake

The USFWS confirmed that giant garter snakes use the rice fields and fresh emergent wetlands within the construction disturbance area of the proposed Delevan Pipeline. Giant garter snakes are also known to occur in the CBD, which could have construction-related impacts where the pipeline crosses the CBD. The pipeline would take approximately two years to build, and would be conducted outside of a November through April timeframe for protection of the giant garter snake. The pipeline would likely be constructed in sections, so that loss of habitat would occur in stages, rather than for the entire length of the pipeline all at once. Because dredged material from the underground footprint of the pipeline would potentially be spread over the entire width of the construction disturbance area, total loss of habitat would occur temporarily within the disturbance area. Fallowing of rice fields would not only temporarily remove giant garter snake habitat, but could also have adverse effects on the reproduction, recruitment, and survival of this species that could continue beyond the two-year construction schedule. The temporary loss of fresh emergent wetland habitat, as well as the extensive temporary loss of rice habitat resulting from construction activities associated with implementation of Alternative A, would have a **significant impact** on the giant garter snake, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Pond Turtle

Construction of the proposed Delevan Pipeline could temporarily disturb existing canal habitat within the construction disturbance area. Western pond turtles were observed within the disturbance area along an irrigation canal. Although the area would be restored after construction is complete, construction activities could result in the direct mortality of this species. Therefore, construction of the Delevan

Pipeline associated with implementation of Alternative A would have a **potentially significant impact** on western pond turtles, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Yellow-Billed Cuckoo

Construction of the proposed Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard would temporarily disturb existing deciduous orchards within the construction disturbance area. The special-status western yellow-billed cuckoo uses deciduous orchards when the orchards are located near riverine and riparian habitat. However, the orchards within the construction disturbance area of these pipelines are located approximately 11 miles west of the Sacramento River, and therefore, do not represent suitable habitat for this species. Therefore, construction of the Delevan and TRR pipelines associated with implementation of Alternative A would have a **no impact** on western yellow-billed cuckoos, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Construction of the proposed pipelines would require an open trench. Exposed pipeline trenches could trap small mammals, amphibians, or reptiles moving through the area, including the special-status giant garter snake. Nocturnal wildlife would have a high risk of falling into the trenches. Wildlife could be injured during the fall into the trench, and once trapped would have no access to food, water, or shelter. Trapped wildlife would also be at risk of predation. The open trench associated with construction of the pipelines resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction and maintenance of the proposed pipelines, road, and electrical switchyard. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Therefore, the human disturbance associated with construction and maintenance of the pipelines, road, and electrical switchyard resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Transmission Line

The Delevan Transmission Line would parallel, and be completely within the construction disturbance area of, the proposed Delevan Pipeline, with the exception of the westernmost 3.5 miles. Because the impacts of the eastern approximately nine miles of the proposed transmission line route construction disturbance area are already accounted for in the impact assessment for the Delevan Pipeline, only the temporary ground disturbance of the remaining 3.5 miles of the transmission line are analyzed here. Disturbed habitats would be restored to their original habitat type after construction is complete. The construction disturbance area of the Delevan Transmission line would result in the temporary disturbance of wildlife habitats (Table 14-16).

Table 14-16
Temporary Disturbance of Wildlife Habitat from Construction of the Delevan Transmission Line: Alternative A

Habitat	Number of Acres Affected for the Entire Length of the Transmission Line	Number of Acres Affected for the Section of the Transmission Line Outside of the Delevan Pipeline Construction Disturbance Area
Annual grassland	69.5	69.5
Barren*	0.5	0.5
Canal	1.5	1.2
Dryland grain and seed crops	25.6	1.5
Deciduous orchard	0.4	0
Eucalyptus	0.3	0
Fresh emergent wetland	2.1	0
Irrigated row and field crops	9.4	0
Lacustrine	1.0	0
Pasture	24.5	0
Rice	143.0	0
Urban/disturbed	1.1	0
Valley foothill riparian	1.1	1.1
TOTAL	**280.0**	**73.8**

*Barren habitat includes fallowed agricultural fields.

Although the proposed transmission line would be an above-ground feature and have no associated permanent ground disturbance, the footings of the transmission towers would result in the permanent loss of wildlife habitat. Based on a worst-case scenario, the total permanent habitat loss associated with the footings would be approximately 2.5 acres of a combination of rice and annual grassland habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland

Annual grassland within the construction disturbance area of the proposed Delevan Transmission Line has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The temporary disturbance of 69.5 acres and the potential permanent loss of up to 2.5 acres of annual grassland habitat, resulting from the construction of the transmission line associated with implementation of Alternative A, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Barren

Barren habitat within the construction disturbance area of the proposed Delevan Transmission Line consists of fallowed agricultural fields. During Project construction, additional agricultural fields would be temporarily fallowed. The only special-status species that has the potential to use this type of barren habitat is the wintering mountain plover. This species was not observed within any of the Project facility sites, but is known to occur in southeast Colusa County. Depending on the time of year and duration of construction activities, the temporary disturbance of 0.5 acre of barren habitat resulting from construction of the Delevan Transmission Line associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Canal

The canal habitat within the construction disturbance area of the proposed Delevan Transmission Line is represented by the location where the construction disturbance area crosses the T-C Canal. The transmission line would be aligned above and across the canal, but would not disturb existing infrastructure. Because no loss of canal habitat or disturbance of the main channel would occur as a result of transmission line construction associated with implementation of Alternative A, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Dryland Grain and Seed Crops

Dryland grain and seed crops within the construction disturbance area of the proposed Delevan Transmission Line have the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. The temporary disturbance of 1.5 acres of dryland grain and seed crops resulting from the construction of the transmission line associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian

Valley foothill riparian habitat within the construction disturbance area of the proposed Delevan Transmission Line has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams, with the exception of elderberry shrubs, which are not present within the disturbance area. The temporary disturbance of 1.1 acres of valley foothill riparian habitat resulting from the construction of the Delevan Transmission Line associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

No special-status species were observed within the vicinity of the construction disturbance area for the proposed Delevan Transmission Line, and on-the-ground disturbance would be limited to tower footings. Therefore, construction activities associated with these facilities resulting from implementation of Alternative A would be expected to have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Transmission lines can provide perch sites for birds, but the length of the transmission line that would be aligned from the Sacramento River to the proposed Sites Electrical Switchyard also has the potential to create conflicts with birds. Raptors and other birds may collide with the conductors (i.e., wires) on the transmission line towers during their construction and operation; however, the construction activities associated with the towers are not expected to interfere with bird movement. The eastern end of the transmission line would be located adjacent to the Delevan NWR, and could, therefore, disrupt a migratory corridor by causing collisions. The potential disruption of a migratory corridor, as well as the increased risk of collisions resulting from the construction and operation of the Delevan Transmission Line associated with implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of the proposed transmission lines. Construction activities would include the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials, which could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Transmission line towers are often used by nesting osprey and other raptors. If an osprey nest were established, maintenance activities could disturb this species during incubation or before young have fledged. Therefore, the human disturbance associated with construction, operation, and maintenance of the transmission line resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Delevan Pipeline Intake Facilities

Construction activities associated with the proposed Delevan Pipeline Intake Facilities, which includes a fish screen and pumping/generating facility located on the Sacramento River, would result in the direct and permanent loss of wildlife habitats (Table 14-17).

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these proposed facilities. The construction disturbance area for the Delevan Pipeline is located adjacent to these facilities and could potentially be used as a staging area. Disturbed areas would be restored to their original habitat type after construction is complete. The wildlife habitat that would be most affected by this construction disturbance area would be deciduous orchard habitat.

Table 14-17
Permanent Wildlife Habitat Loss Due to the Construction of the Delevan Pipeline Intake Facilities: Alternative A

Habitat	Permanent Loss (Acres)
Canal	0.6
Deciduous orchard	11.1
Riverine	1.6
Urban/disturbed	4.2
Valley foothill riparian	1.6
TOTAL	**19.1**

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Canal

Canal habitat within the footprint of the proposed Delevan Pipeline Intake Facilities consists of a small irrigation canal, and has the same value to wildlife as described in the impact assessment for Holthouse Reservoir and Dam. The permanent loss of 0.6 acre of canal habitat resulting from construction activities associated with implementation of Alternative A would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Deciduous Orchard

Deciduous orchard habitat within the footprint of the proposed intake facilities, which consists of walnut orchards, is located immediately adjacent to the Sacramento River. Deciduous orchards with a riverine/riparian edge are used by numerous wildlife species, including the special-status western yellow-billed cuckoo. The permanent loss of 11.1 acres of deciduous orchard habitat resulting from the construction of the Delevan Pipeline Intake Facilities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Riverine

Riverine habitat within the footprint of the proposed Delevan Pipeline Intake Facilities consists of a portion of the Sacramento River. The construction disturbance area would be located immediately downstream of the existing Maxwell Irrigation District (ID) Pumping Plant. The Sacramento River supports numerous wildlife species, including the special-status bank swallow, American white pelican, and bald eagle. The permanent loss of 1.6 acres of riverine habitat associated with construction of the Delevan Pipeline Intake Facilities resulting from implementation of Alternative A would have a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the footprint of the proposed Delevan Pipeline Intake Facilities consists of small maintenance buildings and associated access roads. Construction of the intake facilities would require the demolition of the maintenance buildings, which could provide roosting habitat for bats. Therefore, the permanent loss of 4.2 acres of urban/disturbed habitat resulting from the construction of the Delevan Pipeline Intake Facilities associated with implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Valley Foothill Riparian

Valley foothill riparian habitat within the footprint of the proposed Delevan Pipeline Intake Facilities has the same value to wildlife as described in the impact assessment for Sites Reservoir and Dams. There is one elderberry shrub within the construction footprint and a second elderberry shrub adjacent to the footprint. The State fully-protected ringtail was observed using this habitat within the footprint of the intake facilities. This riparian habitat has the potential to support the special-status western yellow-billed cuckoo, Swainson's hawk, western pond turtle, long-eared owl, and the yellow warbler. The permanent loss of 1.6 acres of valley foothill riparian habitat resulting from the construction of the Delevan Pipeline Intake facilities associated with implementation of Alternative A would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Bank Swallow

Construction of the proposed Delevan Pipeline Intake Facilities would result in the loss of approximately 660 linear feet (0.1 mile) of river bank. This section of the bank supports riparian habitat. There are no steep barren banks that are suitable for bank swallow excavation. Bank swallow colonies have been documented near this location in previous years, but the lack of barren habitat and the geologic control in this section of the river makes it unsuitable for excavation, and therefore, unsuitable nesting habitat, for the bank swallow. Therefore, the habitat loss associated with the construction of the Delevan Pipeline Intake Facilities resulting from implementation of Alternative A would have **no impact** on bank swallows, when compared to Existing Conditions and the No Project/No Action Alternative.

Ringtail

The State fully-protected ringtail was observed within the riparian habitat that would be removed during construction of the proposed Delevan Pipeline Intake Facilities. The loss of 1.6 acres and 660 linear feet of this habitat type would further reduce the connectivity of the riparian corridor at this location, which could reduce the value of the adjacent riparian habitat to the ringtail. The loss of 1.6 acres of riparian habitat resulting from the construction of the Delevan Pipeline Intake Facilities associated with implementation of Alternative A would be a **potentially significant impact** to the ringtail, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities would occur within the footprint of the facilities and would not further disrupt habitat connectivity. However, noise and night-time lighting associated with these activities could affect habitat quality for the ringtail and would have a **potentially significant impact**.

Valley Elderberry Longhorn Beetle

One elderberry shrub exists within the riparian habitat that would be displaced as a result of construction of the proposed Delevan Pipeline Intake Facilities. Protocol-level surveys were conducted on this elderberry shrub, and no emergence holes were found. A second elderberry shrub is located adjacent to the footprint of the proposed facility, within an orchard on the edge of an irrigation canal that is aligned parallel to an access road. This road may be used during construction, operation, and maintenance activities; consequently, the shrub could be adversely affected. This second elderberry shrub has not been surveyed.

Although no emergence holes were found on the surveyed shrub, the loss of this elderberry shrub and the possible disturbance of a second shrub during construction associated with implementation of Alternative A would be a **significant impact** to the valley elderberry longhorn beetle, when compared to Existing Conditions and the No Project/No Action Alternative.

Western Yellow-Billed Cuckoo

The 1.6 acres of riparian habitat that would be lost as a result of construction of the proposed Delevan Pipeline Intake Facilities are located immediately adjacent to walnut orchards, of which 11.2 acres would be lost. Both of these habitat types are used by the western yellow-billed cuckoo along the Sacramento River. During a 2010 survey, cuckoos were detected along the river 4.5 miles upstream and 1.5 miles downstream of the footprint of the proposed Intake Facility. It is possible that the habitat within the construction footprint is also used by this species, although it was not detected during Project surveys or during the 2010 survey at this location. The loss of riparian and deciduous orchard habitat along the Sacramento River resulting from construction of the Delevan Pipeline Intake Facilities associated with implementation of Alternative A would be a **potentially significant impact** to the western yellow-billed cuckoo, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would occur within the footprint of the facilities and would not be expected to adversely affect the surrounding riparian or orchard habitat. Noise levels associated with maintenance activities, such as sediment removal, are expected to be similar to the levels associated with the proposed pumps, as well as the existing Maxwell ID pumps, and would not be expected to substantially adversely affect this species. Therefore, maintenance activities associated with these facilities would have a **less-than-significant impact** on the western yellow-billed cuckoo.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The valley foothill riparian habitat that exists along the banks of the Sacramento River provides a travel corridor for numerous terrestrial wildlife species, including the fully-protected ringtail. Gaps in the connectivity of this corridor create higher risks of predation for wildlife that travel through these areas. Therefore, the removal of 660 linear feet of valley foothill riparian habitat along the Sacramento River associated with construction of the proposed Delevan Pipeline Intake Facilities resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities would not be expected to result in additional ground disturbance or placement of facilities, and therefore, would have a **less-than-significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Refer to the **Impact Wild-2** discussion for the potential impact of noise and night-time lighting on the ringtail.

Wildlife and wildlife habitats may be directly or indirectly affected by Project-related construction, operation, and maintenance of the intake facilities. Construction activities would include sheet pile driving and the use of heavy equipment, and would result in increased traffic from the transportation of personnel and materials. These activities could lead to increased mortality from vehicles and increased disturbance from noise and artificial lighting. Operation and maintenance would require vehicle access to these facilities, and may require nighttime safety lighting, which can adversely affect many wildlife species, especially nocturnal species. Pump operation could result in increased noise levels that may adversely affect wildlife. Therefore, the human disturbance associated with construction, operation, and maintenance of these facilities resulting from implementation of Alternative A would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Project Buffer

Within the Proposed Take Line, the following activities are expected to occur: fence construction, the demolition of existing structures, and fuelbreak maintenance. The acreage of wildlife habitats included within the Proposed Take Line buffer is presented in Table 14-18.

Table 14-18
Acres of Wildlife Habitat Within the Project Buffer[a]: Alternative A

Habitat	Acres within Project Buffer
Annual grassland	8,083.1
Barren[b]	2.9
Blue oak woodland	4,180.1
Canal	15.8
Chamise-redshank chapparal	1.9
Deciduous orchard	77.8
Dryland grain and seed crops	134.3
Irrigated row and field crops	151.2
Lacustrine	17.2
Pasture	15.7
Rice	21.1
Riverine	0.1

Table 14-18
Acres of Wildlife Habitat Within the Project Buffer[a]: Alternative A

Habitat	Acres within Project Buffer
Urban/disturbed	35.4
Valley foothill riparian	63.4
TOTAL	**12,800.0**

[a]Calculated by subtracting the acreage of permanent disturbance associated with each proposed Project facility that is surrounded by the Project Buffer, the acreage of existing Funks Reservoir, and the acreage of the portion of the existing GCID Canal that is surrounded by the Project Buffer, from the total acreage of land that would be acquired for the Project.

[b]Barren includes fallow/idle agricultural fields.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Annual Grassland, Barren, Blue Oak Woodland, Canal, Chamise-Redshank Chaparral, Lacustrine, and Valley Foothill Riparian

The above-listed wildlife habitat types within the Project Buffer have the same value to wildlife as described for other Project features, and would not be altered or converted to other habitat types. Construction and maintenance activities associated with fence building would have a negligible impact on these habitat types because the footprint of the fence posts would be small and a large portion of the Project Buffer is already fenced. However, the potential creation and maintenance of a fuelbreak would require vegetation clearing that, if maintained around the entire perimeter of the Project Buffer, could result in a substantial adverse effect due to the loss of wildlife habitat. Therefore, the potential loss of wildlife habitat associated with construction and maintenance of the Project Buffer fuelbreak resulting from implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Deciduous Orchard, Dryland Grain and Seed Crops, Irrigated Row and Field Crops, Pasture, and Rice

The above-listed agricultural habitat types within the Project Buffer have the same value to wildlife as described for other Project features, but would not be maintained as agricultural lands after Project construction is complete. These agricultural lands would be converted to natural wildlife habitat, likely to annual grassland habitat. Although some wildlife species would benefit from this conversion, other wildlife species may be adversely affected. Therefore, the loss of 211.4 acres of agricultural habitat types that would be converted to natural habitat types within the Project Buffer as a result of implementation of Alternative A would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Urban/Disturbed

The urban/disturbed habitat within the Project Buffer consists of roads and structures. Construction activities within the Project Buffer would include the demolition of existing structures that may provide roosting habitat for bats. After demolition activities cease, the urban/disturbed habitat would be converted to natural wildlife habitat, likely to annual grassland habitat. This habitat conversion may benefit several wildlife species. However, potential loss of bat roosting habitat associated with the demolition of structures within the Project Buffer resulting from implementation of Alternative A would be a

potentially significant impact, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Activities associated with fence construction and maintenance could result in the temporary disturbance of special-status wildlife species. Demolition of existing structures during construction has the potential to result in the loss of roosting habitat for special-status bats. The creation of a fuelbreak would result in the loss of habitat that may be used by special-status wildlife species, and maintenance of the fuelbreak could disturb those species. Therefore, construction and maintenance activities that would occur within the Project Buffer would have a **potentially significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The potential construction of barbed wire fencing around the perimeter of the Project Buffer in the few areas where fencing does not already occur would not be expected to interfere with wildlife movement. Fencing already occurs around most, if not all, of the property lines, and the fence design would allow wildlife to go under, through, or over the fencing. Periodic fence maintenance would not be expected to interfere with wildlife movement. The construction and maintenance of a fuelbreak would eliminate vegetative cover within the footprint of the fuelbreak, but would not be expected to substantially interfere with wildlife movement. Therefore, the construction and maintenance of fencing and the fuelbreak within the Project Buffer associated with implementation of Alternative A would have a **less-than-significant impact** on wildlife movement, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-4: Indirect Effects on Common Wildlife from Human Disturbance

Although signs would be posted to prevent recreationists from using the Project Buffer lands, it is likely that unauthorized hiking, biking, or other recreational activity would occur within the take line. In addition, the construction crews required to demolish existing structures or build fences would cause a temporary disturbance to wildlife. Maintenance activities associated with fencing and the fuelbreak could also disturb wildlife. Therefore, human disturbance associated with Project Buffer activities would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-5: Conflict with the Provisions of an Adopted HCP, NCCP, or Other Approved Local or Regional HCP, or Conflict with any Local Policies or Ordinances Protecting Biological Resources, such as a Tree Preservation Policy or Ordinance

Refer to the **Impact Wild-5** discussion for Sites Reservoir Inundation Area and Sites Reservoir Dams.

Summary of Alternative A Impacts to Wildlife Habitats

Construction, operation, and maintenance of Alternative A would result in the permanent loss of 13,572.6 acres, and the temporary disturbance of an additional 5,357.9 acres of wildlife habitat (Table 14-19).

Table 14-19
Acres of Wildlife Habitat Subject to Alternative A Construction Impacts[a]

Habitat Type	Acreage	
	Permanent Loss[b]	Temporary Disturbance[c]
Annual grassland	12,151.8	2,091.4
Barren	0.2	21.4
Blue oak woodland	501.4	644.5
Canal	9.1	14.1
Chamise-redshank chaparral	0.6	1.9
Deciduous orchard	15.4	175.1
Dryland grain and seed crops	333.2	214.5
Eucalyptus	0	46.2
Fresh emergent wetland[d]	0.5	18.5
Irrigated row and field crops	155.6	225.7
Lacustrine	20.8	2,264.0
Mixed chaparral	0.8	1.8
Pasture	72.7	241.2
Rice	122.9	1,383.6
Riverine	1.6	0
Urban/disturbed	88.1	46.9
Valley foothill riparian	94.5	4.7
Valley oak woodland	3.4	0
TOTAL	**13,572.6**	**5,357.9**

[a]Calculated acreage does not include acres associated with the Project Buffer because the location and extent of disturbance is not yet specified.

[b]Total permanent wildlife habitat loss acreage includes the defined footprints of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Intake Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction of facilities within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.

[c]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and the footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations and South Bridge (minus the acreage of estimated permanent loss), Delevan Pipeline, TRR Pipeline, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modifications. Total temporary disturbance acreage also includes the estimated construction disturbance areas (outside of the facility footprints) for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Tunnel from Sites Pumping Generating Plant to Sites Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Intake Facilities.

[d]Fresh Emergent Wetland includes alkaline wetlands.

14.3.7 Impacts Associated with Alternative B

14.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**), would be the same as described for Alternative A for the Extended Study Area.

14.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B operations on wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**) would be the same as described for Alternative A for Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex, Trinity River, Klamath River, Spring Creek, Clear Creek, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

For the remaining facilities, the indirect impacts to native plants from human disturbance (**Impact Wild-4**) and conflicts with conservation plans (**Impact Wild-5**) would also be the same as described for Alternative A.

Operational differences for Alternative B, when compared to Alternative A for Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, the Sacramento River, Sutter Bypass, and Yolo Bypass, are discussed below.

Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake

Operational modeling results for Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative, are similar to those described for Alternative A as Alternative B would also result in improved storage conditions. However, Alternative B operations would result in more variable reservoir surface water elevation fluctuations than Alternative A.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

With implementation of Alternative B, these reservoirs would experience more variability in surface water elevation fluctuations, when compared to Alternative A. However, these fluctuations would still be less severe than when compared to Existing Conditions or the No Project/No Action Alternative. Therefore, operational changes at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake associated with implementation of Alternative B that would result in improved storage and reduced water level fluctuations would have a **beneficial effect** on wildlife habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to special-status wildlife species.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-1** discussion. That discussion is also applicable to interference with wildlife movement.

Sacramento River

Operational modeling indicates that Sacramento River flows associated with implementation of Alternative B would experience changes similar to those described for Alternative A. However, Alternative B would divert up to 3,900 cfs during winter flows (rather than the 5,900 cfs diversion that would occur with Alternative A during winter flows). The reduced rate of diversion would consequently require a longer duration of diversion, lasting from February through May.

Modeling performed using SRH-1DV and SacEFT indicates that the coverage of the valley foothill riparian vegetation alliance along the Sacramento River would increase or remain similar with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative. The only exception is that SacEFT indicates a slight increase in the number of years with post-initiation scour risk for Fremont Cottonwood seedlings with implementation of Alternative B, when compared to the No Project/No Action Alternative. For bank swallows, SacEFT modeling indicates negligible effects that would result from peak flow during nesting season and a slight decrease in habitat potential and suitability with implementation of Alternative B, when compared to the Existing Conditions and the No Project/No Action Alternative. The decrease in habitat potential and suitability resulting from implementation of Alternative B would be slightly greater than the decrease resulting from implementation of Alternative A.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Despite the change in the rate and duration of diversion, operational modeling for Alternative B, including modeling that is specific to riparian habitat, indicates that minimal effects would occur to riparian habitat resulting from the described changes in the flow regime. Therefore, riparian habitat downstream of the intakes would not be expected to be adversely affected. Modifications of the existing flow regime of the Sacramento River resulting from implementation of Alternative B would have a **less-than-significant impact** on riparian habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Despite the change in the rate and duration of diversion, operational modeling for Alternative B, including modeling that is specific to riparian habitat, indicates that minimal effects would occur to riparian habitat resulting from the described changes in the flow regime. Therefore, riparian habitat downstream of the intakes would not be expected to be adversely affected, nor would the special-status birds or mammals associated with riparian habitat. SacEFT modeling specific to the bank swallow also indicates that there would be minimal effects to this species. Therefore, modifications of the existing flow regime of the Sacramento River resulting from implementation of Alternative B would have a

less-than-significant impact on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Sutter Bypass

Implementation of Alternative B would divert up to 3,900 cfs during winter flows; in comparison, Alternative A would result in the diversion of up to 5,900 cfs during winter flows. The reduced rate of diversion would require a longer duration of diversion.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Alternative B, when compared to Alternative A, would reduce the velocity and volume of floodwaters entering the Bypass from the Sacramento River, but diversions would be reduced by 2,000 cfs. Although the rate of diversion would be reduced, the duration of diversion would be longer, and therefore, could result in a greater reduction of water volume than described for Alternative A. This reduction in the frequency, velocity, and volume of water entering the Bypass would have the same effects on riparian and wetland habitats as described for Alternative A. Therefore, the relatively minor modification of the existing flow regime of the Sutter Bypass associated with implementation of Alternative B that would result in reduced magnitude and duration of floodwaters entering the Bypass would have a **less-than-significant impact** on riparian and wetland habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Alternative B's reduction in the frequency, velocity, and volume of water entering the Bypass would have the same effects on wildlife species as described for Alternative A. Therefore, the relatively minor modification of the existing flow regime of the Sutter Bypass associated with implementation of Alternative B that would result in reduced magnitude and duration of floodwaters entering the Bypass would be a **potentially beneficial effect** to special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild Impact-3** discussion for Alternative A. The relatively minor change in the flow regime with implementation of Alternative B would have a **less-than-significant impact** on wildlife nursery sites, when compared to Existing Conditions and the No Project/No Action Alternative.

Yolo Bypass

Operational modeling for Alternative B indicates that that there would be a minor reduction in the duration and magnitude of flows entering into the Yolo Bypass.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The relatively minor reduction in the frequency, velocity, and volume of water entering the Bypass associated with implementation of Alternative B would have the same effects on riparian and wetland habitats as described for Alternative A. The modification of the existing flow regime of the Yolo Bypass associated with implementation of Alternative B that would result in minor reductions in the frequency, velocity, and volume of floodwaters entering the Bypass would, therefore, have a **less-than-significant impact** on riparian and wetland habitat, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The relatively minor reduction in the velocity and volume of water entering the Bypass associated with implementation of Alternative B would have the same effects on riparian and wetland habitats as described for Alternative A, and would, therefore, not adversely affect the associated species. The minor modification of the existing flow regime of the Yolo Bypass associated with implementation of Alternative B that would result in the reduced frequency, velocity, and volume of floodwaters entering the Bypass, would, therefore, have a **less-than-significant impact** on special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. The minor modification of the existing flow regime of the Yolo Bypass that would result in the reduced frequency, velocity, and volume of floodwaters entering the Bypass as a result of implementing Alternative B would have a **less-than-significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

14.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to terrestrial biological resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

Although the footprint of the Recreation Areas would be the same for Alternatives A and B, the associated electrical distribution line alignment would differ as a result of the change in location of Golden Gate Dam. With implementation of Alternative B, 2.9 fewer acres of annual grassland would be affected by the Recreation Area Electrical Distribution Line construction disturbance area. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**) as described for Alternative A.

In addition, the road relocations associated with Alternative B differ from those for Alternative A, mostly due to changes to the saddle dam access roads. An additional 2.5 acres of wildlife habitats would be affected by Alternative B roads. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included in the Project Buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**) as described for Alternative A.

For the remaining facilities, the effects of human disturbance on wildlife (**Impact Wild-4**) and conflicts with habitat plans (**Impact Wild-5**) would also be the same as described for Alternative A. However, for Alternative B, the footprint and/or construction disturbance area of Sites Reservoir and Dams, the Delevan Transmission Line, and the Delevan Discharge Facilities differ from Alternative A. These changes would affect different acreages of wildlife habitat. The differences between these facilities and their impacts on terrestrial biological resources are described below.

Sites Reservoir Inundation Area and Sites Reservoir Dams

Alternative B includes the construction of a 1.81-MAF Sites Reservoir, which requires the construction of Sites Dam, Golden Gate Dam, and nine saddle dams. For Alternative B, Sites Dam would have a larger footprint and Golden Gate Dam shifts location, when compared to Alternative A. Construction-related ground-disturbing activities and vegetation removal, and the subsequent filling of the reservoir, would result in the direct and permanent loss of the same wildlife habitats as described in Alternative A, but more acreage would be lost with the construction and filling of the larger reservoir (Table 14-20).

Table 14-20
Permanent Wildlife Habitat Loss Due to the Construction and Filling of the 1.81-MAF Sites Reservoir and Associated Dams: Alternative B Compared to Alternative A

Habitat	Permanent Loss (Acres) Alternative A	Permanent Loss (Acres) Alternative B	Additional Loss Associated with Alternative B when Compared to Alternative A
Annual grassland	11,654.6	13,196.9	1,542.3
Blue oak woodland	353.5	739.7	386.2
Dryland grain and seed crops	206.9	206.9	0
Lacustrine	20.2	21.8	1.6
Pasture	61.0	61.0	0
Urban/disturbed	76.1	78.8	2.7
Valley foothill riparian	81.5	97.5	16.0
Valley oak woodland	3.4	3.5	0.1
TOTAL	**12,457.2**	**14,406.1**	**1,948.9**

The construction disturbance area for the 1.81-MAF Sites Reservoir would be the same as described for the 1.27-MAF Sites Reservoir. The construction disturbance area could disturb as much as 1,000 acres of land, with the majority of disturbed habitat consisting of annual grassland habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

Construction of the Alternative B reservoir and dams would result in the additional permanent loss of nearly 1,950 acres of wildlife habitat, when compared to Alternative A. The two habitat types most affected by the increased acreage would be annual grassland and blue oak woodland. The permanent loss and temporary disturbance of wildlife habitat resulting from the construction activities and filling of the reservoir associated with implementation of Alternative B would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The impacts of Alternative B on special-status wildlife species would be the same as described for Alternative A, with the exception of the impact on bald eagles. Construction of the larger Alternative B Golden Gate Dam would result in the direct take of an established bald eagle nest and nest tree because the tree is located within the proposed footprint of the dam. The disturbance or removal of this nest tree during the nesting season could result in the direct mortality of eggs or young, and the permanent loss of this nest tree would be a **significant impact** to bald eagles, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

Refer to the **Impact Wild-2** discussion. That discussion is also applicable to interference with wildlife movement.

Delevan Transmission Line

The design of the Delevan Transmission Line associated with Alternative B differs from that of Alternative A. Because there would be no pumping/generating plant associated with the Delevan Pipeline Discharge Facility, there would be no transmission line aligned from the Sacramento River to the existing PG&E or WAPA transmission line. There would, however, still be a transmission line aligned approximately three miles from the Sites Electrical Switchyard to the existing PG&E or WAPA transmission line. The construction disturbance area of the Delevan Transmission Line for Alternative B would result in the temporary disturbance of wildlife habitats, but at a much smaller scale than described for Alternative A (Table 14-21).

Table 14-21
Temporary Disturbance of Wildlife Habitat Due to the Construction of the Delevan Transmission Line: Alternative B Compared to Alternative A

Habitat	Temporary Disturbance (Acres) for the Entire Length of the Delevan Transmission Line for Alternative A	Temporary Disturbance (Acres) for the Section of the Alternative A Transmission Line outside of the Construction Disturbance area of the Delevan Pipeline	Temporary Disturbance (Acres) for the Entire Length of the Delevan Transmission Line for Alternative B
Annual grassland	69.5	69.5	54.6
Barren*	0.5	0.5	0
Canal	1.5	1.2	0.6
Dryland grain and seed crops	25.6	1.5	0
Deciduous orchard	0.4	0	0
Eucalyptus	0.3	0	0
Fresh emergent wetland	2.1	0	0
Irrigated row and field crops	9.4	0	0
Lacustrine	1.0	0	0

Table 14-21
Temporary Disturbance of Wildlife Habitat Due to the Construction of the Delevan Transmission Line: Alternative B Compared to Alternative A

Habitat	Temporary Disturbance (Acres) for the Entire Length of the Delevan Transmission Line for Alternative A	Temporary Disturbance (Acres) for the Section of the Alternative A Transmission Line outside of the Construction Disturbance area of the Delevan Pipeline	Temporary Disturbance (Acres) for the Entire Length of the Delevan Transmission Line for Alternative B
Pasture	24.5	0	0
Rice	143.0	0	0
Urban/disturbed	1.1	0	0
Valley foothill riparian	1.1	1.1	1.1
TOTAL	**280.0**	**73.8**	**56.3**

*Barren habitat includes fallowed agricultural fields.

The footings of the transmission towers would result in the permanent loss of wildlife habitat. Based on a worst-case scenario, the total permanent habitat loss associated with the footings would be approximately 0.5 acre of annual grassland habitat, which is less than the 2.5-acre loss associated with Alternative A.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The reduced length of the Alternative B Delevan Transmission Line would result in the temporary disturbance of approximately 17 fewer acres of wildlife habitat than Alternative A, and would result in the permanent disturbance of approximately two fewer acres. The habitat type most affected by this decreased acreage would be annual grassland. Despite the reduction in the number of acres affected, the total permanent loss and temporary disturbance of annual grassland and valley foothill riparian habitat resulting from construction of the Alternative B transmission line would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

The impacts of Alternative B on special-status wildlife species would be the same as described for Alternative A.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

In contrast to Alternative A, the shortened Alternative B transmission line would not extend to the Sacramento River and would not be located adjacent to the Delevan NWR. In addition, the shortened transmission line would reduce the potential for avian collision, when compared to Alternative A. However, the remaining risk of collision and the potential disruption of a migratory corridor associated with the Alternative B transmission line would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Discharge Facility

For Alternative B, the Delevan Pipeline would be operated as a release-only pipeline. The associated Delevan Pipeline Discharge Facility would, therefore, not include a fish screen or any of the facilities needed for pumping and generating operations that were described for Alternative A. The ground-disturbing activities associated with the construction of the Delevan Pipeline Discharge Facility would result in the direct and permanent loss of wildlife habitats (Table 14-22), but habitat loss would occur at a smaller scale than described for the Intake Facilities for Alternative A.

Table 14-22
Direct and Permanent Wildlife Habitat Loss Due to the Construction of the Delevan Pipeline Discharge Facility: Alternative B Compared to the Alternative A Delevan Pipeline Intake Facilities

Habitat	Permanent Loss (Acres) by Alternative A	Permanent Loss (Acres) by Alternative B
Canal	0.6	0.1
Deciduous orchard	11.1	3.9
Riverine	1.6	0.1
Urban/disturbed	4.2	2.0
Valley foothill riparian	1.6	1.6
TOTAL	**19.1**	**7.7**

Additional acreage of temporary disturbance would occur as a result of a construction disturbance area for these facilities. The construction disturbance area for the Delevan Pipeline would be located adjacent to these facilities and could potentially be used as a staging area. Disturbed areas would be restored to their original habitat type after construction is complete. The wildlife habitat that would be affected by this construction disturbance area would be deciduous orchard habitat.

Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS

The smaller proposed Delevan Pipeline Discharge Facility would result in the permanent loss of approximately 12 fewer acres of wildlife habitat than Alternative A. The habitat type most affected would be deciduous orchard. Despite the reduction in the number of acres affected, the total permanent loss of wildlife habitat resulting from construction of the Alternative B discharge facility would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS

Construction of the proposed Delevan Pipeline Discharge Facility would result in the loss of approximately 140 linear feet (0.03 mile) of river bank, as compared to the loss of 660 linear feet (0.1 mile) associated with the Alternative A Intake Facilities. Despite the reduced Alternative B impact on the river bank, the number of acres of valley foothill riparian habitat that would be lost would be the same as described for Alternative A. This loss of river bank and riparian habitat would reduce the connectivity of the riparian corridor at this location, which could reduce the value of the habitat to the ringtail and western yellow-billed cuckoo. Despite the reduced number of acres of deciduous orchard habitat loss associated with Alternative B, the loss of this habitat, combined with the loss of riparian habitat, could adversely affect the western yellow-billed cuckoo. Despite the reduced size of the footprint of the Delevan Pipeline Discharge Facility, the shift in its location would result in the take of a second elderberry shrub that is located adjacent to the footprint of the Delevan Pipeline Intake Facilities and could adversely affect the valley elderberry longhorn beetle. Therefore, the Alternative B discharge facility would have a **potentially significant impact** on these special-status wildlife species, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wild-3: Substantial Interference with the Movement of any Native Resident or Migratory Wildlife Species, or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites

The valley foothill riparian habitat that exists along the banks of the Sacramento River provides a travel corridor for numerous terrestrial wildlife species, including the fully-protected ringtail. Gaps in the connectivity of this corridor create higher risks of predation for wildlife that have to travel through these areas. Therefore, the removal of 140 linear feet of valley foothill riparian habitat along the Sacramento River associated with construction of the proposed Delevan Pipeline Discharge Facility resulting from implementation of Alternative B would have a **potentially significant impact** on terrestrial wildlife, when compared to Existing Conditions and the No Project/No Action Alternative.

Summary of Alternative B Impacts to Wildlife Habitats

Construction, operation, and maintenance of Alternative B would result in the permanent loss of 15,508.3 acres, and the temporary disturbance of an additional 5,341.4 acres, of wildlife habitat (Table 14-23).

Table 14-23
Acres of Wildlife Habitat[a] Subject to Alternative B Construction Impacts

Habitat Type	Acreage	
	Permanent Loss[b]	Temporary Disturbance[c]
Annual grassland	13,694.4	2,079.4
Barren	0.2	20.9
Blue oak woodland	887.5	644.3
Canal	8.6	13.5
Chamise-redshank chaparral	0.6	1.9
Deciduous orchard	8.2	174.0
Dryland grain and seed crops	331.2	213.0
Eucalyptus	0	46.2
Fresh emergent wetland	0.5	18.5
Irrigated row and field crops	155.6	225.7
Lacustrine	22.4	226.4
Mixed chaparral	0.8	1.8
Pasture	72.7	241.2
Rice	121.2	1,383.6
Riverine	0.1	0
Urban/disturbed	88.6	46.9
Valley foothill riparian	110.2	4.1
Valley oak woodland	3.5	0

Table 14-23
Acres of Wildlife Habitat[a] Subject to Alternative B Construction Impacts

Habitat Type	Acreage	
	Permanent Loss[b]	Temporary Disturbance[c]
TOTAL	**15,508.3**	**5,341.4**

[a]Calculated acreage does not include acres associated with the Project Buffer because the location and extent of disturbance is not yet specified.
[b]Total permanent habitat loss acreage includes the footprint of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Discharge Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.
[c]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and the footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations (minus the acreage of estimated permanent loss), Delevan Pipeline, TRR Pipeline, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modifications. Total temporary disturbance acreage also includes the estimated construction disturbance areas (outside of the footprints) for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Tunnel from Sites Pumping Generating Plant to Sites Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Modifications, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Discharge Facilities.

14.3.8 Impacts Associated with Alternative C

14.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**), would be the same as described for Alternative A for the Extended Study Area.

14.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C operations on wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**) would be the same as described for Alternative A for Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Lake Natoma, Thermalito Complex, Trinity River, Klamath River, Spring Creek, Clear Creek, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

Because Alternative C includes the three Project intake locations that were described for Alternative A, the operational impacts associated with Alternative C, as they relate to wildlife habitat (**Impact Wild-1**), special-status wildlife species (**Impact Wild-2**), and wildlife movement (**Impact Wild-3**), as well as the potential impacts from human disturbance (**Impact Wild-4**), or conflicts with habitat plans (**Impact Wild-5**), would be the same as described for Alternative A for Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, Sacramento River, Sutter Bypass, and Yolo Bypass.

14.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction, operation, and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to terrestrial biological resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Delevan Transmission Line and Delevan Pipeline Intake Facilities included in Alternative C are the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to botanical resources as described for Alternative A.

The Alternative C design for the Sites Reservoir Inundation Area and Dams, Electrical Distribution Lines associated with the Recreation Areas, and Road Relocations and South Bridge are the same as described for Alternative B. These facilities would require the same construction, operation, and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to terrestrial biological resources as described for Alternative B.

The boundary of the Project Buffer is the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

Summary of Alternative C Impacts to Wildlife Habitats

Construction, operation, and maintenance of Alternative C would result in the permanent loss of 15,536.72 acres, and the temporary disturbance of an additional 5,329.4 acres, of wildlife habitat (Table 14-24).

Table 14-24
Acres of Wildlife Habitat[a] Subject to Alternative C Construction Impacts

Habitat Type	Acreage	
	Permanent Loss[b]	**Temporary Disturbance[c]**
Annual grassland	13,694.7	2,091.5
Barren	0.2	21.4
Blue oak woodland	887.5	6443.
Canal	9.1	14.1
Chamise-redshank chaparral	0.6	2.1
Deciduous orchard	15.4	175.1
Dryland grain and seed crops	333.2	214.5
Eucalyptus	0	46.2
Fresh emergent wetland	0.5	18.5
Irrigated row and field crops	155.6	225.7
Lacustrine	22.4	226.6
Mixed chaparral	0.8	1.8
Pasture	72.7	241.2
Rice	122.9	1,383.6
Riverine	1.6	0
Urban/disturbed	90.8	46.9
Valley foothill riparian	110.2	4.1
Valley oak woodland	3.5	0
TOTAL	**15,521.7**	**5,357.6**

[a]Calculated acreage does not include acres associated with the Project Buffer because the location and extent of disturbance is not yet specified.

[b]Total permanent habitat loss acreage includes the footprint of Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and the Delevan Pipeline Intake Facilities. Total permanent loss acreage also includes the estimated permanent loss from construction within the footprint of the Recreation Areas, within the construction disturbance area for the Road Relocations, and from construction of the transmission tower footings associated with the Delevan Transmission Line.

[c]Total temporary disturbance acreage includes the footprint of the Recreation Areas (minus the acreage of estimated permanent loss) and the footprint of the existing Funks Reservoir, as well as the defined construction disturbance areas for the Road Relocations (minus the acreage of estimated permanent loss), Delevan Pipeline, TRR Pipeline, Holthouse to T-C Canal Pipeline, TRR to Funks Creek Pipeline, Delevan Transmission Line, and GCID Canal Facilities Modifications. Total temporary disturbance acreage also includes the estimated construction disturbance areas for Sites Reservoir and Dams, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Tunnel from Sites Pumping Generating Plant to Sites Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Connection to the TRR, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Intake Facilities.

14.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 14-25 for the impacts that have been identified as significant or potentially significant.

Table 14-25
Summary of Mitigation Measures for
NODOS Project Impacts to Terrestrial Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Wild-1: A Substantial Adverse Effect, Including Alteration of Habitat Suitability, on any Wildlife Habitat, Especially Riparian Habitat or Other Sensitive Natural Communities Identified in Local or Regional Plans, Policies, Regulations, or by DFG or USFWS	All Primary Study Area Project Facilities (construction)	Significant or Potentially Significant	Mitigation Measure Wild-1a: Implement a Combination of Habitat Protection, Enhancement, Restoration, or Conservation Easement Measures, in Consultation with USFWS	Less than Significant
	Sites Reservoir, Road Relocations, Sites Outlet Structure, Delevan Pipeline Intake/Discharge Facilities, Project Buffer (construction)	Potentially Significant	Mitigation Measure Wild-1b: Implement Bat Exclusion Measures Prior to Demolition of Existing Structures	Less than Significant
Impact Wild-2: A Substantial Adverse Effect, Including Mortality, Either Directly or Through Habitat Modifications, on any Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by DFG or USFWS				
Impact Wild-2a: Bald Eagle	Sites Reservoir and Dams (construction operation)	Significant	Mitigation Measure Wild-2a: Obtain Permit for Bald Eagle Nest Tree Removal, Remove Nest Tree Outside of Breeding Season, and Create Suitable Habitat	Less than Significant
Impact Wild-2b: Bank Swallow	Delevan/TRR Pipelines (construction)	Potentially Significant	Mitigation Measure Wild-2b: Implement Protective Actions to Prevent Bank Swallows from Nesting in the Cut Banks of Project Construction Trenches	Less than Significant
Impact Wild-2c: Giant Garter Snake	Delevan Pipeline, GCID Canal Facilities Modifications (construction)	Significant	Mitigation Measure Wild-2c: Conduct Pre-Construction Surveys for Giant Garter Snakes and Implement Protective Actions. Conduct Project Construction Activity Between May 1 and October 1 in Giant Garter Snake Habitat. Compensate for Temporary Disturbance of Habitat According to USFWS Guidelines	Less than Significant

Table 14-25
Summary of Mitigation Measures for
NODOS Project Impacts to Terrestrial Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Wild-2d: Golden Eagle	Sites Reservoir and Dams (construction), Recreation Areas (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Wild-2d: Implement Avoidance and Minimization Measures at Historic or Active Golden Eagle Nest Sites. Conduct Satellite Telemetry Studies Pre- and Post-Construction to Determine Territory Size. Prepare a Golden Eagle Protection Plan and a Golden Eagle Monitoring Plan. Mitigate for Loss of Annual Grassland Foraging Habitat	Significant and Unavoidable
Impact Wild-2e: Ringtail	Delevan Intake/Discharge Facilities (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Wild-2e: Implement Protective Actions to Minimize Impacts to the Ringtail, and Restore Connectivity of Riparian Corridor	Less than Significant
Impact Wild-2f: Valley Elderberry Longhorn Beetle	Sites Reservoir and Dams (construction), Road Relocations (construction, operation), Delevan Pipeline Intake/Discharge Facilities (construction)	Significant	Mitigation Measure Wild-2f: Implement Protective Actions to Avoid or Minimize Impacts to Elderberry Plants. Where Avoidance is not Possible, Transplant or Replace Plants, According to USFWS Guidelines	Less than Significant
Impact Wild-2g: Western Burrowing Owl	Sites Reservoir and Dams (construction), Road Relocations (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Wild-2g: Conduct Pre-Construction Surveys for Western Burrowing Owls. If Owls are Found, Implement Protective Actions	Less than Significant
Impact Wild-2h: Western Pond Turtle	Sites Reservoir and Dams (construction, operation), Holthouse Reservoir Complex (construction), Delevan Pipeline (construction)	Potentially Significant	Mitigation Measure Wild 2h: Conduct Pre-Construction Surveys and Provide a Biological Monitor During Project Construction for the Western Pond Turtle. If Found, Turtles shall be Captured and Relocated by a Qualified Biologist	Less than Significant
Impact Wild-2i: Yellow-Billed Cuckoo	Delevan Pipeline Intake/Discharge Facilities (construction)	Potentially Significant	Mitigation Measure Wild-2i: Conduct Pre-Construction Surveys for the Western Yellow-Billed Cuckoo and Schedule Construction Activities to Avoid Impacts to Nest Sites	Less than Significant

Table 14-25
Summary of Mitigation Measures for
NODOS Project Impacts to Terrestrial Biological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Wild-3: Substantial interference with the movement of any native resident or migratory wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Delevan Pipeline (construction), Delevan Transmission Line (construction and operation), Delevan Pipeline Intake/Discharge Facilities (construction)	Potentially Significant	Mitigation Measure Wild-3a: During Project Construction, Backfill Trenches within 72 hours of Pipeline Installation and Provide an Escape Ramp for Trapped Wildlife Mitigation Measure Wild-3b: Construct Transmission Lines and Associated Equipment Following Suggested Practices for Avian Protection on Power Lines Mitigation Measure Wild-3c: Restore Riparian Habitat Connectivity	Less than Significant
Impact Wild-4: Indirect effects on common wildlife from human disturbance	All Primary Study Area Project Facilities (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Wild-4: Implement Avoidance and Minimization Measures.	Less Than Significant

Note:
LOS = Level of Significance

Mitigation Measure Wild-1a: Implement a Combination of Habitat Protection, Enhancement, Restoration, or Conservation Easement Measures, in Consultation with USFWS

For all three action alternatives, the acreage of permanent habitat loss within the Recreation Areas and the Road Relocations, as well as the temporary habitat disturbance within the construction disturbance areas for most facilities, was estimated. Because these acres are estimated, it may be possible to avoid impacts to certain habitat types.

A Habitat Evaluation Procedures assessment of the Primary Study Area was conducted under the lead of USFWS. A determination of appropriate mitigation measures for the habitat types that would be adversely affected within the Primary Study Area shall be made using the results of the HEP assessment, as well as through consultation with USFWS pursuant to the Fish and Wildlife Coordination Act. Mitigation measures could include but not be limited to protection, enhancement, restoration, or conservation easement.

Mitigation Measure Wild-1b: Implement Bat Exclusion Measures Prior to Demolition of Existing Structures

Prior to structure demolition, structures shall be inspected by a qualified biologist to determine if bats are present, and if present, to determine if the structure is being used as a day, night, or maternity roost. If a roost is present, appropriate bat exclusion measures shall be implemented at least five to seven days prior to structure demolition outside of the maternity season, which can range from mid-April through August 31, and outside of the winter months when bats could be hibernating. Bat exclusion measures could include one-way devices such as polypropylene netting, plastic sheeting, or tube-type excluders that would be placed at all active entry points. If a roost is present in a structure located outside of a reservoir inundation area, possible avoidance measures could include retaining the structure.

Mitigation Measure Wild-2a: Obtain Permit for Bald Eagle Nest Tree Removal, Remove Nest Tree Outside of Breeding Season, and Create Suitable Habitat

A permit to remove or relocate an eagle nest shall be obtained from USFWS. The bald eagle nest tree shall be removed outside of the breeding season, which ranges from January through July, to avoid direct impacts. Dam construction activities shall not occur during the breeding season until the nest tree is removed. After construction is complete, the filling of Sites Reservoir and Holthouse Reservoir would create new fish-bearing lacustrine habitat in an area that is surrounded by suitable bald eagle nest trees. Following inundation, releases downstream of Golden Gate Dam would restore flows to Funks Creek to maintain fisheries and bald eagle habitat.

Mitigation Measure Wild-2b: Implement Protective Actions to Prevent Bank Swallows from Nesting in the Cut Banks of Project Construction Trenches

Construction of the pipelines shall begin in May due to giant garter snake restrictions. May falls within the bank swallow breeding season (ranging from mid-March through July). Protective action shall be taken to prevent bank swallows from attempting to nest within the cut banks of the pipeline trenches. Actions shall include the placement of a mesh net on all cut banks during the bank swallow nesting season, and implementation of **Mitigation Measure Wild-3a** to ensure that trenches are backfilled within 72 hours of pipeline installation.

Mitigation Measure Wild-2c: Conduct Pre-Construction Surveys for Giant Garter Snakes and Implement Protective Actions. Conduct Project Construction Activity Between May 1 and October 1 in Giant Garter Snake Habitat. Compensate for Temporary Disturbance of Habitat According to USFWS Guidelines

Protective actions shall be taken to avoid or minimize impacts to the giant garter snake. Protective actions and mitigation measures shall comply with the USFWS's Programmatic Biological Opinion (USFWS, 1997) and could include the following actions:

- Preconstruction surveys shall be conducted within 24 hours prior to the start of construction in giant garter snake habitat. If a snake is encountered during construction, activities shall cease until corrective measures have been completed. Any sightings shall be reported to USFWS.
- Exclusion fencing shall be placed around construction areas within giant garter snake habitat to ensure that snakes do not enter the area. Exclusion fencing shall also be used around any agricultural irrigation ditches within 200 feet of the disturbance area.
- Construction activity within giant garter snake habitat shall be conducted between May 1 and October 1. If work outside of this time period is necessary, USFWS's Sacramento Fish and Wildlife Office shall be contacted to determine which additional protection measures are necessary.
- Construction personnel shall receive USFWS-approved environmental awareness training so that workers can recognize giant garter snakes and their habitats.
- Clearing shall be confined to the defined construction disturbance area.

- Rice fields shall be fallowed prior to the start of construction, and any dewatered habitat shall remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.
- Construction between May and September in wetlands shall be restricted to prevent inadvertent mortality of giant garter snakes.
- A trained biological monitor shall be onsite during construction activities to inspect around the work equipment and within the trench and surrounding disturbance area each day before work begins.
- **Mitigation Measure Wild-3a** shall be implemented to avoid potential entrapment of a snake in the pipeline trench.
- After construction is complete, habitat shall be restored to pre-Project conditions.

Temporary disturbance to giant garter snake habitat would typically be mitigated at a ratio of 1:1. However, construction activity for the Delevan Pipeline is scheduled to occur during three giant garter snake seasons (season is from May 1 through October 1). Any disturbance lasting longer than two seasons is considered to be a permanent loss of habitat and shall be mitigated at a ratio of 3:1, with some of the mitigation compensated for through restoration of the area after Project construction is complete. If Project construction is conducted outside of the May 1 through October 1 active season, mitigation at a ratio of 6:1 could be required.

Disturbance to fresh emergent wetland habitat could, and shall to the extent feasible, be avoided by reducing the use of the construction buffer in areas of this habitat type, or altering the footprint of the road. Mitigation for rice habitat would already be partially compensated for by implementation of the mitigation for loss of wildlife habitat types described above.

Mitigation Measure Wild-2d: Implement Avoidance and Minimization Measures at Historic or Active Golden Eagle Nest Sites. Conduct Satellite Telemetry Studies Pre- and Post-Construction to Determine Territory Size. Prepare a Golden Eagle Protection Plan and a Golden Eagle Monitoring Plan. Mitigate for Loss of Annual Grassland Foraging Habitat

Golden eagle nests were observed within the footprint of three of the five proposed Recreation Areas during field surveys. Subsequent surveys documented that the nest at Lurline Headwaters Recreation Area no longer exists, the nest at Peninsula Hills Recreation Area is still active, and the nest at Stone Corral Recreation Area is falling apart, but is still active. An active golden eagle nest also exists outside, but in the vicinity, of the Sites Dam footprint.

Construction activities shall be modified to ensure that nesting golden eagles are protected. To avoid impacts to nesting golden eagles at Peninsula Hills, construction of the recreation area would be deferred. To avoid or minimize possible impacts to nesting golden eagles in other construction areas, some or all of the following measures shall be implemented:

- A bird detraction program shall be implemented near historic golden eagle nest sites to discourage eagles from returning to those sites.
- Construction near recently active nest sites shall start outside the active nesting season. The nesting period for golden eagles is between March 1 and August 15.

- If groundbreaking activities begin during the nesting period, a qualified biologist shall perform a pre-construction survey 14 to 30 days before the start of each new construction phase to search for golden eagle nest sites in appropriate habitat within 0.5 mile of proposed activities. If active nests are not identified, no further action is required and construction may proceed.
- If active nests are identified, a minimum 0.5 mile buffer zone around active golden eagle nests shall be implemented. Buffer zones shall remain until young have fledged. For activities conducted with agency approval within this buffer zone, a qualified biologist shall monitor construction activities and the eagle nest(s) to monitor eagle reactions to activities. If activities are deemed to have a negative effect on nesting eagles, the biologist shall immediately inform the construction manager that work should be halted, and CDFG and USFWS will be consulted.
- For golden eagles that begin nesting within the buffer zone after start of construction, the same avoidance and minimization measures as described for active eagle nests found before start of construction (0.5 mile buffer) shall be implemented. A buffer of less than 0.5 mile may be used if there is a visual barrier, such as a hill or dense trees, between the construction activity and the nest.

After construction is complete, it is possible that golden eagles will nest within the constructed Recreation Areas. In this situation, the following avoidance and minimization measures shall be implemented:

- After construction, golden eagle nesting sites shall be surveyed and monitored within and adjacent to the Recreation Areas to ensure that recreational activities do not disrupt eagle nest sites. Surveys shall be performed at the beginning of, and continue through, the nesting season. Consistent with avoidance guidelines, recreational access and other disruptive activities shall be suspended within 0.5 mile of active golden eagle nests until the young eagles have fledged.

The filling of Sites Reservoir would result in the loss of more than 11,600 acres (Alternative A) and almost 13,200 acres (Alternatives B and C) of annual grassland that provides foraging habitat for golden eagles. To assess the impact of this loss of foraging habitat, the following measures shall be implemented prior to the start of Project construction:

- A Golden Eagle Monitoring Plan shall be prepared.
- Satellite telemetry studies shall be conducted for three to five years prior to the start of construction to establish the number of golden eagles and the size of their territories.
- Surveys shall be conducted by permitted biologists.
- A Golden Eagle Protection Plan shall be prepared.

After construction is complete, at least five years of telemetry studies (to be determined during consultation with USFWS) shall be conducted to determine the effect of habitat loss. The loss of the annual grassland habitat shall be mitigated during consultation with USFWS; mitigation may include the preservation of annual grassland habitat located near the Primary Study Area that could provide foraging habitat for golden eagles, or could consist of restoring a historic foraging site that is no longer used because of an impact.

Mitigation Measure Wild-2e: Implement Protective Actions to Minimize Impacts to the Ringtail, and Restore Connectivity of Riparian Corridor

The fully-protected ringtail was observed within the riparian habitat that would be removed during construction of the Delevan Pipeline Intake/Discharge Facilities. The removal of riparian habitat within the footprint of the facilities would further reduce connectivity of the riparian corridor at that location. Implementation of **Mitigation Measure Wild-3c** would restore that connectivity. To minimize potential direct impacts to the ringtail, riparian vegetation removal shall not occur during the early pup-rearing season, which ranges from May 1 through June 15. Efforts to restore riparian corridor connectivity could include other habitat enhancements, such as providing ringtail nesting cavities and planting food sources.

Mitigation Measure Wild-2f: Implement Protective Actions to Avoid or Minimize Impacts to Elderberry Plants. Where Avoidance is not Possible, Transplant or Replace Plants, According to USFWS Guidelines

There are two elderberry shrubs located within the potential construction disturbance area for Sites Reservoir and Dams that could be completely avoided by establishing and maintaining a 100-foot-wide or wider buffer around them. Construction crews shall be briefed regarding the need to avoid these plants, and signs shall be posted during construction to avoid the buffer area. After Project construction is complete, this area would not be affected by Project operation or maintenance.

The elderberry shrub immediately adjacent to the footprint of the Delevan Pipeline Intake/Discharge Facility is located on the edge of an irrigation canal that is situated along an existing access road. Because of its proximity to the road, it would not be possible to establish a 100-foot-wide buffer. It would also not be possible to establish a 100-foot-wide buffer for the shrubs located immediately adjacent to the existing Maxwell Sites Road. Consultation with USFWS would be initiated for possible approval to encroach on the buffer. Otherwise, appropriate mitigation measures shall be implemented.

The elderberry shrubs within the footprint of Sites Reservoir, Sites Dam, and Golden Gate Dam, as well as the one shrub within the footprint of the Delevan Pipeline Intake/Discharge Facility, would not be avoided by Project construction, and therefore, shall be transplanted or replaced, depending on the likelihood of survival post-transplantation. Transplantation procedures shall comply with USFWS's 1999 Conservation Guidelines for the Elderberry Longhorn Beetle (USFWS, 1999b). If transplantation is not feasible, USFWS general guidelines require replacement of elderberry plants in designated mitigation areas. Elderberry plants are typically replaced at a ratio of 2:1 for stems greater than one inch in diameter at ground level with no adult emergence holes, 3:1 for stems where emergence holes are documented in less than 50 percent of the shrubs, and 5:1 for stems greater than one inch in diameter with emergence holes.

Mitigation measures already required for the loss of riparian habitat pursuant to the mitigation for loss of wildlife habitat types described above could potentially compensate for the native planting requirement for elderberry plant mitigation.

Mitigation Measure Wild-2g: Conduct Pre-Construction Surveys for Western Burrowing Owls. If Owls are Found, Implement Protective Actions

Pre-construction surveys shall be conducted in annual grasslands within the footprint of Sites Reservoir and within the construction disturbance area of the Road Relocations to determine if burrowing owls are present. These surveys shall be conducted within 30 days of ground-disturbing construction activities or the start of the filling of reservoir. Surveys shall be conducted by a qualified biologist in compliance with the Burrowing Owl Survey Protocol and Mitigation Guidelines (CBOC, 1993). If burrowing owl burrows are found, protective measures shall be implemented.

Protective measures may include avoidance of occupied burrows during the nesting season, which is from February 1 through August 31, with the peak of the season occurring from April 15 through July 15. Any unoccupied burrows located within the immediate construction area shall be excavated using hand tools, and then filled to prevent reoccupation.

If destruction of occupied burrows is unavoidable, such as within the footprint of Sites Reservoir, burrow entrances shall be altered, outside of the nesting season, to allow resident owls to exit but not re-enter the burrow. Owls shall be excluded from burrows by installing one-way doors in burrow entrances. One-way doors shall be left in place for at least 48 hours to ensure owls have left the burrow before the start of construction. Other possible mitigation could include the creation of artificial burrows in adjacent suitable habitat.

Loss of annual grassland habitat shall be compensated for with implementation of the mitigation for loss of wildlife habitat types described above.

Mitigation Measure Wild-2h: Conduct Pre-Construction Surveys and Provide a Biological Monitor During Project Construction for the Western Pond Turtle. If Found, Turtles shall be Captured and Relocated by a Qualified Biologist

Before construction activities begin, a qualified biologist shall conduct western pond turtle surveys along creeks and other ponded areas within the footprint of Sites Reservoir, Sites Dam, and Holthouse Reservoir, as well as along the irrigation canals within the construction disturbance area of the Delevan Pipeline. Adjacent upland areas shall also be examined for evidence of nests or individual turtles. A Project biologist shall be responsible for conducting the survey and relocating any turtles found within footprints or construction disturbance areas. If a nest is observed, a biologist with appropriate permits and prior approval from CDFG shall move eggs to a suitable location or facility for incubation. However, some individuals may be undetected or enter sites after surveys are conducted, and could be subject to mortality. A biological monitor shall, therefore, be present during Project construction to minimize take.

Mitigation Measure Wild-2i: Conduct Pre-Construction Surveys for the Western Yellow-Billed Cuckoo and Schedule Construction Activities to Avoid Impacts to Nest Sites

The yellow-billed cuckoo breeding season ranges from mid-June through August. To minimize direct impacts to this species, riparian and orchard vegetation removal within the footprint of the Delevan Pipeline Intake/Discharge Facility shall occur outside of these dates. If construction activities are scheduled to occur during the breeding season, preconstruction surveys shall be conducted in riparian and orchard habitat within the construction disturbance area of the Delevan Pipeline Intake/Discharge Facility to confirm that cuckoos are not actively nesting in or near the area. If active nests are identified, a minimum 500-foot construction buffer shall be established around any nest sites. All construction shall be avoided where active nests are discovered until the cuckoos have finished nesting.

Loss of valley foothill riparian and deciduous orchard habitat shall be compensated for with implementation of the mitigation for loss of wildlife habitat types described above.

Mitigation Measure Wild-3a: During Project Construction, Backfill Trenches within 72 hours of Pipeline Installation and Provide an Escape Ramp for Trapped Wildlife

Pipeline trenches shall be backfilled within 72 hours of pipeline installation to prevent potential impacts to trapped wildlife. The trench shall be inspected for wildlife before it is filled. At the end of each day, a ramp shall be placed at the end of the trench at an approximate 45 degree slope to allow trapped wildlife to escape. In addition to a ramp, the trench shall be covered to prevent wildlife from falling in.

Mitigation Measure Wild-3b: Construct Transmission Lines and Associated Equipment Following Suggested Practices for Avian Protection on Power Lines

Transmission lines, poles, and associated equipment shall be properly fitted with wildlife protective devices to isolate and insulate structures to prevent injury or mortality to wildlife, especially avian species. Protective measures shall follow the guidelines provided in Suggested Practices for Avian Protection on Power Lines (APLIC, 2006), and shall include insulating hardware or conductors against simultaneous contact, using poles that minimize impacts to birds, and increasing the visibility of conductors or wires to prevent or minimize bird collisions.

Mitigation Measure Wild-3c: Restore Riparian Habitat Connectivity

After the Delevan Pipeline Intake/Discharge Facilities are constructed, riparian habitat connectivity shall be restored to provide a travel corridor for terrestrial wildlife. The entire length of the land side of the new levee associated with the facilities shall be planted with riparian vegetation. Where the levee approaches SR 45, fencing shall be installed to protect wildlife from vehicles. Vegetation shall be monitored, and irrigated if necessary, to ensure survival.

Mitigation Measure Wild-4: Implement Avoidance and Minimization Measures

Measures to avoid or minimize human disturbance impacts associated with Project construction and maintenance activities shall include the following:

- Provide worker awareness training to all construction personnel prior to the start of construction activities; such training shall explain how to avoid impacts to sensitive species or habitats.
- Require construction personnel to comply with applicable federal, State, and local laws and regulations regarding prevention and control of noise during Project construction.
- Equip construction equipment engines with adequate mufflers, intake silencers, and engine enclosures.
- Turn off construction equipment during prolonged periods of nonuse to eliminate noise.
- Maintain all equipment appropriately, and train equipment operators regarding good practices to reduce noise levels.
- Minimize light pollution to the greatest extent practicable. Measures may include, but not be limited to, light hoods/shields, directional lighting, or minimum required brightness.
- Conduct pre-construction surveys in habitat types for special-status species. If found, protective actions shall be taken to passively relocate wildlife as needed.

- Use exclusion fencing or equivalent to prevent wildlife from entering the Project construction area. Fencing shall be removed after construction is complete.
- A biological monitor shall be on-site during Project construction in habitat associated with special-status species.
- Removal of trees and other vegetation shall occur outside of the breeding/nesting season of associated special-status species, and shall be completed prior to the start of reservoir filling to minimize impacts to tree- or shrub-nesting species. If Project construction must occur during the breeding/nesting season, a USFWS or DFG-approved buffer shall be established around the sensitive areas.
- Demolition of structures and bridge maintenance shall occur outside of the breeding/roosting season. If Project construction or maintenance must occur during this period, exclusionary devices shall be installed during late fall or winter to prevent roosting in structures.
- Maintenance of transmission lines or towers shall not be conducted during the nesting season in proximity to an active raptor nest.
- Food-related garbage items, such as wrappers, cans, bottles, or food scraps, shall not be left at the Project construction sites.
- Persons associated with the Project shall not be permitted to have pets of any kind within the Project construction sites.

Measures to avoid or minimize human disturbance impacts associated with Project recreation activities shall include the following:

- Implement adequate signage, fencing, and leash laws in areas of public access to minimize potential harassment of wildlife, including handling, by people and pets.
- Retain or plant screening vegetation along the margins of developed areas to reduce indirect impacts from lights and noise and the effects of human disturbance.
- Retain mature trees and minimize use of non-native landscaping.
- Design recreational areas with physical barriers to limit impacts to adjacent habitat.
- Revegetate areas of disturbed soil.
- Establish boat speed limits and designate no wake zones in sensitive areas to minimize disturbance of lacustrine wildlife and erosion of shoreline habitat.
- Provide adequate numbers of wildlife-proof garbage containers and maintain a pick-up schedule of at least once per week during the recreation season.
- For exterior lighting, use light shields or downward directed lighting to minimize the impacts of artificial light.

Measures to avoid or minimize impacts from human disturbance impacts associated with increased traffic during Project construction shall include the following:

- Restrict all movement of construction vehicles outside of the right-of way to pre-designated access or public roads.

- Enforce an approved speed limit on Project right-of way and access roads, unless otherwise posted, for all Project personnel.

Implementation of **Mitigation Measures Wild-1a, Wild-1b, Wild-2a, Wild-2b, Wild-2c, Wild-2e, Wild-2f, Wild-2g, Wild-2h, Wild-2i, Wild-3a, Wild-3b, Wild-3c,** and **Wild-4** would reduce the level of significance of Project impacts to **less than significant.**

Implementation of **Mitigation Measure Wild-2d** would result in Project impacts remaining **significant and unavoidable.**

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15. Wetlands and Other Waters of the United States

15.1 Introduction

This chapter provides a description of the wetlands and other waters of the United States (U.S.) for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. *Wetlands*, which are waters of the U.S., are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. *Other waters of the U.S.* include all waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.[1]

The regulatory setting for wetlands and waters of the U.S. is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially impacts, where appropriate. Project-related impacts to the water quality in wetlands or waters of the U.S. are described in Chapter 7 Surface Water Quality.

15.2 Environmental Setting/Affected Environment

15.2.1 Extended Study Area

15.2.1.1 Methodology

This section describes the Extended Study Area with respect to jurisdictional waters pursuant to the Clean Water Act Section 404, including wetlands and other waters of the U.S. In the Extended Study Area, CVP and SWP water deliveries are made to urban users, agricultural users, to Level 4 wildlife refuges, and to San Luis Reservoir. Only San Luis Reservoir and Level 4 wildlife refuges are described for the Extended Study Area, because no wetlands or other waters of the U.S would be involved in water deliveries to urban or agricultural lands.

Information describing existing wetland or waters resources for San Luis Reservoir is based on research conducted for the Bay Delta Conservation Plan.

To describe the extent of wetlands and other waters of the U.S. potentially affected in wildlife refuges, GIS was used to examine the 11 selected Wildlife Refuges and Wildlife Areas for the National Wetland Inventory (NWI) (USFWS, 1999) perennial wetlands they contain. A comparison of the 1999 wetland mapping with mapping available in 2011 shows no change in attributes for the 11 selected wildlife refuges. Using the ArcView 9.3 GIS program (ESRI, 2010), polygons were obtained for perennial wetland areas within outlines of wildlife refuges receiving Level 4 CVP and SWP water deliveries

[1] For more detail regarding the definition of waters of the U.S., the reader is referred to the program definitions document at http://water.epa.gov/lawsregs/lawsguidance/cwa/wetlands/regs_index.cfm

(Figure 1-7 in Chapter 1 Introduction).Acreages of the resulting areas were calculated using GIS to provide an estimate of wetlands and other waters of the U.S. that could potentially receive an alternate source of Level 4 water supply if one of the alternatives is implemented. Categories of NWI wetland types selected were all freshwater non-tidally influenced wet areas: Palustrine – all categories; Riverine – Lower Perennial/Emergent, Intermittent-Streambed/Vegetated, and Unconsolidated Shore/Vegetated categories.

15.2.1.2 Wetlands and Waters of the U.S.

San Luis Reservoir

Existing acreage, capacity, water levels, and extent of fluctuation of San Luis Reservoir are described in Chapter 6 Surface Water Resources. San Luis Reservoir's drawdown zone fluctuates between 45 and 90 vertical feet. Within this drawdown zone, temporary narrow strips of herbaceous, often weedy, wetland vegetation or riparian wetland vegetation, such as willow scrub, become established for part of the year in temporary narrow bands and fragmented patches. Where rivers or streams enter the reservoir, more established riparian wetland patches can be found adjacent to the stream.

Wildlife Refuges

The approximate extents of various types of wetlands that exist in the 11 selected Wildlife Refuges and Wildlife Areas are listed in Table 15-1. Acres of other waters of the U.S. (ponds, lakes, streams) that receive Level 4 water deliveries within the 11 selected Wildlife Areas and Refuges are listed in Table 15-1. The "Riverine" portions may or may not receive Level 4 water. The "Other" category represents wetland types that are undefined by the NWI.

Table 15-1
Potentially Affected Wetlands and Other Waters of the U.S. in the Extended Study Area (National Wetlands Inventory Types)

Wildlife Refuge/Area	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Fresh-water Pond	Lake	Other	Riverine	Totals for All Wetland Types
	(Acres)						
Sacramento NWR	7,318.4	26.8	153.9	303.0	0	0	7,802.1
Delevan NWR[a]	2,631.5	6.0	70.0	44.8	0	0	2,752.3
China Island Unit/Salt Slough Unit of the North Grasslands WA[b]	589.5	130.4	73.0		31.2	127.5	951.7
West Bear Creek Unit of the San Luis NWR Complex	810.1	126.3	6.8	0	39.4	36.0	1,018.7
Grasslands Water District	39,221.6	293.2	1,889.6	693.8	88.0	82.6	42,268.9
Volta WA	2,549.7	0	13.3	100.5	0	47.8	2,711.4
Merced Unit of the Merced NWR	2,265.3	11.2	5.2			98.1	2,379.7

Table 15-1
Potentially Affected Wetlands and Other Waters of the U.S. in the Extended Study Area (National Wetlands Inventory Types)

Wildlife Refuge/Area	Freshwater Emergent Wetland	Freshwater Forested/ Shrub Wetland	Fresh-water Pond	Lake	Other	Riverine	Totals for All Wetland Types
	(Acres)						
Los Banos WA	3,064.7	26.2	94.8	179.8	0	49.3	3,415.0
Mendota WA	7,662.1	127.0	0	0	12.1	181.5	7,982.7
Pixley NWR	53.5	0	0	616.0	45.1	0	714.6
Kern NWR	8,514.4	242.9	0	1,323.1	125.0	0.5	1,0205.9
Totals for All Level 4 Refuges	**74,680.9**	**990.2**	**2,306.6**	**3,261.1**	**340.8**	**623.4**	**82,203.0**

[a]National Wildlife Refuge
[b]Wildlife Area
Source of wetland types: USFWS, 1999.

15.2.2 Secondary Study Area

15.2.2.1 Methodology

For this discussion, jurisdictional waters whose flows, quantity, seasonality, or quality may be affected by Project operations include only the mainstems of the Sacramento, Trinity, American, and Feather rivers, plus Clear Creek near Shasta Lake. The following facilities would also be potentially affected: Trinity Lake, Lewiston Lake, Klamath River downstream of the Trinity River, Whiskeytown Lake, Shasta Lake, Spring Creek, Keswick Reservoir, Lake Oroville, Thermalito Complex, Folsom Lake, Lake Natoma, Suisun Bay, Sacramento-San Joaquin Delta (and its wetlands), San Pablo Bay and San Francisco Bay.

The Yolo and Sutter bypasses are also considered as “other waters of the U.S.”, even though they are farmed part of the year, due to their hydrological connection with the Sacramento River system. Waters of the U.S. in the Secondary Study Area were quantified by measuring the length (in miles) of the centerline of each river’s main channel, or areas (in acres) of lakes or reservoirs, using GIS software (ESRI, 2006). Acreages for the Suisun Bay and Marsh were obtained from the Delta Atlas (DWR, 1995) and from the DWR geodetic branch for the Legal Delta. Acreages for San Pablo and San Francisco bays were estimated using the measuring tool in the ArcView 9.3 GIS program (ESRI, 2010) on the map of the Secondary Study Area.

15.2.2.2 Wetlands and Waters of the U.S.

The above-listed potentially affected waters of the U.S. in the Secondary Study Area include both rivers that drain mountain and foothill areas, and the lakes or reservoirs that feed or regulate the creeks and rivers. The Sacramento River conveys water from these areas down the center of the Sacramento Valley and into the Delta at its confluence with the San Joaquin River. The Colusa Basin Drain, a natural drainage feature that parallels the Sacramento River on the west side, intercepts westside tributaries and agricultural runoff between Stony Creek and Colusa. All westside tributary streams to the Sacramento River between Red Bluff and Colusa, with the exception of Stony Creek, are intermittent.

Although the area drained by the Sacramento River contains ponds and several kinds of wetlands (including seasonal wetlands, alkaline wetlands, vernal pools, and emergent wetlands), these wetlands are located in upland landscapes and are not hydrologically connected to the main channel of the Sacramento River. The exceptions are small areas of emergent wetland in some of the Sacramento River's off-channel habitats, such as oxbows or cutoffs, in the Red Bluff-to-Colusa reach.

Emergent wetlands usually remain wet throughout the year. They contain vegetation that is rooted under water and stems that emerge above the surface. Typical species include cattails and bulrush. Emergent wetlands are not common along the smaller drainages, but do occur occasionally along drainage canals, larger streams, and pond edges. Extensive wetlands, mostly within tidal influence, occur in the Delta and Suisun Marsh around the north edge of Suisun Bay.

For potentially affected waterways, the flow, hydrograph, diversions, impoundments, main tributaries, pattern of riparian vegetation, and any adjacent wetland areas are described in Chapter 6 Surface Water Resources, Chapter 7 Surface Water Quality, and Chapter 8 Fluvial Geomorphology and Riparian Habitat.

The extent of potentially affected streams and waterways are represented by length in miles of the main channel in Table 15-2; the extent of lakes and reservoirs are represented by acres in Table 15-3; and the extent of wetlands in acres in Table 15-4.

Table 15-2
Potentially Affected Waters of the U.S. in the Secondary Study Area: Rivers and Streams

River or Creek	Miles	Notes
Sacramento River	278.7	Downstream of Shasta Lake
Trinity River	121.3	Between Spring Creek Tunnel and Klamath River confluence
Clear Creek	16.1	Reach between Sacramento River and Whiskeytown Lake
Spring Creek	0.7	Downstream of tunnel (measured from Google Earth)
American River	23.3	Downstream of Folsom Lake
Feather River	66.7	Downstream of Lake Oroville
Sutter Bypass	37.4	
Yolo Bypass	42.0	
Colusa Basin Drain	51.2	Includes Colusa Basin Trough
Total	**636.7**	

Source: ESRI, 2006, unless otherwise noted.

Table 15-3
Potentially Affected Waters of the U.S. in the Secondary Study Area: Lakes and Reservoirs

Lake or Reservoir	Acres	Notes
Trinity Lake	15,972.7	upper part of Claire Engle Lake
Lewiston Lake	715.3	lower part of Claire Engle Lake
Whiskeytown Lake	3,106.7	

Table 15-3
Potentially Affected Waters of the U.S. in the Secondary Study Area: Lakes and Reservoirs

Lake or Reservoir	Acres	Notes
Shasta Lake and Keswick Reservoir	27,847.3	
Lake Oroville	15,394.6	above dam only
Thermalito Complex	4,399.6	Forebay + Afterbay
Folsom Lake	11,062.3	above dam only
Lake Natoma	484.9	
Suisun Bay	30,000.0	Open waters only; Source: DWR, 1995
Sacramento-San Joaquin Legal Delta	737,500.0	Source: DWR Geodetic Branch, pers. comm., 2010
San Pablo Bay	57,600	
San Francisco Bay	256,000	
Total	**1,051,130**	

Source: ESRI, 2006 unless otherwise noted.

Table 15-4
Potentially Affected Waters of the U.S. in the Secondary Study Area: Wetlands

Wetland area	Acres	Notes
Suisun Marsh	52,000	Managed wetlands
Suisun Marsh	6,300	Unmanaged tidal wetlands
Total	**58,300**	

Note:
Acres for Legal Delta, Table 15-3, also include some wetlands

Source: DWR, 1995.

15.2.3 Primary Study Area

15.2.3.1 Methodology

Wetlands and other waters of the U.S. were evaluated within the proposed Sites Reservoir Inundation Area during 1998 and 1999 (DWR, 2000). Wetlands and other waters of the U.S. within proposed Project facility locations such as the Recreation Areas, Road Relocations, Funks Reservoir, and the Delevan Pipeline were evaluated during 2001 and 2002 (DWR, 2005). Project facilities proposed after 2005 were evaluated during 2010 (Eastside Road Extension) and 2011 (Delevan Pipeline Intake/Discharge Facilities and Holthouse Reservoir Complex). Potential wetland features were initially mapped using GIS, based in part on interpretation of aerial photography flown in 1997 for this project (scale: 1:12,000). Preliminary wetland assessments were then made by a field review of hydrologic conditions, plant species composition, and soil characteristics, pursuant to USACE 1987 guidance (USACE, 1987). All potential wetlands were field-mapped using GPS and assigned to a wetland feature type; wetland acreages were then calculated using ArcView 3.2 and ArcGIS 9.3 software (ESRI 2001, 2010). For all Project facilities locations, the jurisdictional status of the wetlands has not been determined or verified by the USACE. One exception is the GCID Canal Facilities, which are not evaluated in this chapter because Project-related modifications would occur within the confines of existing canal facility structures.

Other waters of the U.S. include ponds, small reservoirs, and tributaries. Other waters of the U.S. were first identified and measured using aerial photography, then field-verified where feasible. Acreages were calculated using GIS and Excel. Tributaries were classified by two general width categories (less than 15 feet wide, greater than 15 feet wide) in the proposed Sites Reservoir footprint (DWR, 2000). Due to changes in measurement guidelines, four width categories (0 to 5, 5 to 10, 10 to 15, and greater than 15 feet wide) were evaluated at all other Project facility locations (DWR, 2005). Agricultural canals and ditches visible on aerial imagery were included in the inventory of existing tributary features, but were not field-verified as to extent of wetland vegetation occurring within the ditch or canal, or whether the canal had a direct hydrological connection with a natural stream.

Although the extent of the wetland/other waters of the U.S. surveys conducted within the Sites Reservoir Inundation Area overlaps with portions of the Project Buffer, most of the area within the buffer has not yet been inventoried for waters or wetlands. Wetlands and other waters of the U.S. lying outside of Project facility footprints, but within the Project Buffer, were evaluated at a general level only, using 2009 NAIP aerial imagery and GIS. Results of field surveys or GIS inventories which had already been conducted on much of the land within this buffer as part of Project surveys were used to describe and evaluate wetlands and other waters of the U.S. within the buffer. A survey of this Project component for wetlands and other waters of the U.S. would be conducted prior to Project construction.

15.2.3.2 Wetlands and Waters of the U.S.

Table 15-5 shows presence or absence of wetland features and other waters of the U.S. in the parts of the Primary Study Area that would be occupied by the footprints of the proposed Project facilities, as well as the Delevan Pipeline construction disturbance area. The affected areas are described below. Acres of wetlands and other waters of the U.S. in the Primary Study Area are shown in Table 15-6.

Sites Reservoir Inundation Area, Dams, Recreation Areas, Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Site Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard

The proposed Sites Reservoir inundation area (approximately 14,000 acres) includes most of the Antelope Valley and the drainages of Antelope Creek, Stone Corral Creek, and Funks Creek. All streams within the reservoir footprint and within the proposed roads and recreation areas are ephemeral with little or no flow from June through October. These streams, and especially their smaller tributaries, may rise rapidly with significant rainfall events; however, they may also dry out between events and remain dry for long periods during the winter months.

The majority of the proposed reservoir inundation area is currently used for livestock production. The vegetation consists mostly of non-native annual grasslands with sporadic riparian species along the banks of the creeks and drainages. Several large valley oaks and cottonwoods occur along Antelope Creek, with willows scattered along the smaller drainages. Most of the banks of the creeks are heavily degraded by cattle trampling and trails. Smaller drainages have little to no wetland species associated with them and contain annual weedy species up to the ordinary high water mark. Approximately 148 miles of drainages (including Antelope, Grapevine, Stone Corral, Lurline and Funks creeks) occur within the proposed inundation area. Sixteen acres of small stock ponds occur on drainages throughout the area.

Approximately 153 acres of seasonal wetlands occur throughout the proposed reservoir inundation area. Most are dry by early summer and are associated with low-lying areas of clay or clay loam soils. A small amount of alkaline wetlands, vernal pools, and emergent wetlands also occur within the proposed reservoir inundation area, including Salt Lake.

Golden Gate Dam would be located on Funks Creek and Sites Dam on Stone Corral Creek. Both are active creek channels cutting through steep hillslopes with no other streams or wetlands. The Sites Inlet/Outlet Structure, Pumping/Generating Plant, Tunnel, Electrical Switchyard, Asphalt Batch Plant, and Field Office Maintenance Yard, as well as a 1000-acre construction disturbance area for all of these Project facilities, would be located in the rolling annual grassland east of the reservoir footprint. In this heavily grazed area, a few intermittent streams drain into Funks Creek as it winds through the area just west of existing Funks Reservoir. No other streams, vernal pools or other wetlands occur in this grassland except for scattered disturbed agricultural ponds.

Proposed recreation areas are mostly sited along hilltops and hillsides above the proposed reservoir inundation area. These areas are mostly dominated by various upland vegetation types, such as grasslands and oak savannas. However, all have several drainages that traverse the areas with sporadic riparian and wetland features. Lurline Creek and its associated small wetlands are located along the Lurline Recreation Area access road. Some of the proposed distribution line routes serving the recreation areas cross intermittent streams and, in the case of the Saddle Dam Recreation Area, traverse through areas with vernal pools and other seasonal wetlands.

Wetlands and other waters of the U.S. coinciding with proposed road relocations vary by route segment. Several road segments are located mostly in annual grasslands, but similar to the proposed recreation area distribution lines, cross numerous ephemeral drainages and occasional small seasonal wetlands.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The 228-acre existing Funks Reservoir is bounded primarily by annual grasslands composed of mostly weedy non-native species. Very few trees or wetlands occur along the water's edge. Approximately five acres of seasonal wetlands occur along drainages above the reservoir water's edge. One vernal pool occurs in the grasslands near the upstream end of the reservoir, although it supports very few native vernal pool plant species. The portion of Funks Creek immediately upstream of the reservoir supports a thin line of riparian and other associated trees, and very small patches of wetland vegetation within its bed. In addition, Funks Creek supports an approximately 0.7-acre area of riparian habitat downstream of the existing dam.

The approximately 365-acre area proposed for the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard is composed mostly of annual grassland and agricultural fields. A 13-acre Alkaline Seasonal Wetland complex is located adjacent to and southeast of the Holthouse facilities. The source of water for the wetland complex appears to be seeps located at its southern edge, as well as runoff from both the nearby orchard to the east and the adjacent agricultural land to the north. Underlying soils are predominantly Hillgate and Capay clays and clay loams, with lesser amounts of Corval, Altamont, and other clay soils (NRCS, 1999), which have a very slow infiltration rate, and high water retention capacity typical of clays. Funks Creek flows through the northern third of this area and supports a thin swath of riparian vegetation, including large trees, along its 0.9 mile length, as well as a 1.7-acre area of riparian wetland in its bed near the outlet downstream of the Funks Reservoir Dam.

Table 15-5
Presence of Wetlands and Other Waters of the U.S. at each Proposed Project Facility[a]

Project Facility	Wetland Type					Other Waters of the U.S. Type						Notes
	Alkaline	Emergent	Riparian	Seasonal	Vernal Pool	Pond	Streams 0-5 Feet Wide	Streams 5-10 Feet Wide	Streams 10-15 Feet Wide	Streams <15 Feet Wide	Streams >15 Feet Wide	
Sites Reservoir and Dams	X	X	X	X	X	X	X	X	X	X	X	
Recreation Areas and Distribution Lines				X		X	X	X				
Road Relocations and South Bridge	X	X		X	X	X	X	X	X		X	
Sites Electrical Switchyard							X					
Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure							X	X				
Sites Reservoir Inlet/Outlet Structure and Sites Pumping/Generating Plant						X	X	X	X		X	
Field Office Maintenance Yard								X				
Holthouse Reservoir Complex	X	*	X		*			X	X		X	
Holthouse Reservoir Electrical Switchyard												
GCID Canal Facilities Modifications												Modifications to occur within existing canal only
GCID Canal Connection to the TRR												
TRR							X	X	X		X	Canals
TRR Pumping/Generating Plant												
TRR Electrical Switchyard												
TRR Pipeline and TRR Pipeline Road												Canals
Delevan Transmission Line	X				X	X	X	X	X		X	Canals
Delevan Pipeline	X				X	X	X	X	X		X	Canals
Delevan Pipeline Electrical Switchyard												
Delevan Pipeline Intake/Discharge Facilities							X				X	Sacramento River plus Canal
Project Buffer[b]	X		X	X	X	X	X	X	X		X	

[a]Proposed Project Facility includes the facility footprints of the proposed Project facilities, as well as the Delevan Pipeline construction disturbance area.
[b]The Project Buffer does not include facility footprints, but may overlap with portions of construction disturbance areas.

Table 15-6
Acre Summary of Wetlands and Other Waters of the U.S. in the Primary Study Area

	Acres												
	Wetland Type						Other Waters of the U.S. Type						
	Alkaline[a]	Emergent	Riparian	Seasonal	Vernal Pool	TOTAL WETLAND ACRES	Pond[b]	Streams 0-5 Feet Wide	Streams 5-10 Feet Wide	Streams 10-15 Feet Wide	Streams <15 Feet Wide (Reservoir Only)	Streams >15 Feet Wide (All Project Facilities)	TOTAL OTHER WATERS OF THE U.S.
TOTAL ACRES for Primary Study Area (Project facility footprints) and subject to potential impacts[c]	**36.54**	**2.41**	**25**	**182.41**	**5.81**	**252.17**	**29.66**	**5.87**	**15.09**	**13.28**	**77**	**116.32**	**227.56**

[a]20 acres of Alkaline wetlands include at least 19.5 acres that are adjacent to the footprint rather than within, but would be subject to indirect impacts; 0.5 acre is within footprint.

[b]Includes 6.1 acres for Salt Lake; all remaining ponds are stockponds.

[c]Total acreage does not include acreage associated with the Project Buffer, which has not been surveyed or mapped.

Note:

Primary Study Area is defined here as the non-overlapping set of largest proposed facility footprints, except for the Delevan Pipeline, which also includes a wider construction disturbance area, and the Holthouse Reservoir Complex, where alkaline wetlands include the area adjacent to as well as within the footprint.

GCID Canal Facilities Modifications

This Project facility consists of modifications to the GCID Canal facilities that are contained completely within the existing canal structures. Because this Project component would not generate any ground disturbance or effects on any wetlands or other waters of the U.S., it will not be discussed further in this chapter.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

The 218-acre footprint for this reservoir and associated facilities is located east of the GCID Canal in an area occupied entirely by agricultural fields, mostly rice. The footprints of these facilities cross no streams and contain no wetlands; the only waterways located in this area are agricultural canals.

Delevan Pipeline, Delevan Transmission Line, Terminal Regulating Reservoir Pipeline, and Delevan Pipeline Electrical Switchyard

The proposed Delevan Pipeline and associated Delevan Transmission Line routes are located primarily within the valley floor and bordered by agricultural fields for most of their length. Approximately 2.7 miles west of the Sacramento River, the pipeline/transmission route would cross the Colusa Basin Drain, a large canal that collects agricultural field irrigation water and water intercepted from small streams west of the Sacramento River, conveying it southward to its terminus at the Sacramento River in northeastern Yolo County. The pipeline/transmission line route would also cross a fourteen-acre site of disturbed alkaline wetlands approximately three miles west of the Sacramento River. The Delevan National Wildlife Refuge is located immediately south of the proposed pipeline/transmission line route. The wildlife refuge contains several wetlands and ponds. Numerous canals occur adjacent to or intersect the proposed pipeline/transmission line route. Associated with these canals are adjacent wet areas, wetland vegetation, and some riparian vegetation. Several of these drainages follow historic channels.

Toward its west end, the pipeline and transmission line routes would diverge. The Delevan Pipeline would cross the GCID Canal at the southwest corner of the proposed TRR, and would terminate at the T-C Canal (within the proposed Holthouse Reservoir). The TRR Pipeline would parallel the Delevan Pipeline between these two canals, and the Delevan Pipeline Electrical Switchyard would be located within this section of the pipeline route. Lands between these two canals contain agricultural fields and previously tilled annual grassland. The Delevan Transmission Line route would continue west across both of the canals and would terminate at the proposed Sites Electrical Switchyard and Sites Pumping/Generating Plant. Lands along this portion of the route contain agricultural fields and previously tilled annual grassland, with a small area of alkaline/saline soils.

Delevan Pipeline Intake/Discharge Facilities

The proposed intake and discharge facility site is located east of SR 45, along the bank of the Sacramento River at approximately RM 158.5. The proposed intake would encompass an approximately 19-acre area, mostly on the land side of the river levee, with a small strip on the water side. The proposed discharge facility would occupy a small fraction of the same area, when compared to the proposed intake facility. A few riparian trees, such as valley oaks, Fremont cottonwoods, and black walnuts, occur at the site between the levee and the river's edge. Emergent wetland vegetation occurs in one shallow area along the riverbank. Large tracts of mature mixed riparian growth occur upstream and downstream; however, the area where the new intake and discharge facilities would be located consists mostly of agricultural land (orchards) in the area west of the levee. The intake facility would extend out into the Sacramento River 40 feet and would occupy a small portion of the river's 400- to 500-foot width at this location. The discharge facility would not extend into the river.

Project Buffer

The Project Buffer surrounds all Project facilities, with the exception of the Delevan Pipeline, Delevan Transmission Line, and portions of the roads. Numerous ephemeral streams draining into the Sites Reservoir footprint are located within the Project Buffer, especially in the hills above the western side and south end of the reservoir. Within the Project Buffer are also scattered stockponds and, off the reservoir's northeast edges, portions of the seasonal wetland complexes typical of that part of the Primary Study Area. The Project Buffer also includes smaller segments surrounding the TRR and associated facilities, and the Delevan Pipeline Intake/Discharge facilities at the Sacramento River. Waters of the U.S. within the Project Buffer at both of the latter sites consist only of agricultural canals, except for a short stretch of river edge at the Delevan Pipeline Intake/Discharge facilities.

Sacramento River

Between Red Bluff and Hamilton City, the Sacramento River meanders within a broad floodplain; whereas, from Hamilton City to Colusa, the river meanders between setback levees on both sides. Upstream of Hamilton City, the river is fed by numerous tributary streams; Stony Creek is the only major tributary downstream.

Historically, this reach supported a wide corridor of riparian forest, with valley oaks on the higher terraces. Today, it is estimated that only five to10 percent of California's original riparian forest remains (RHJV, 2011). Along the Sacramento River, approximately 11 percent of the original riparian forest and valley oak woodland remain (SRCAF, 2003). Vegetation consists of large to small patches of willow scrub, cottonwood riparian forest, mixed riparian forest, valley oak riparian forest, and woodland. Marsh and emergent wetlands occur sporadically along sloughs and backwaters. Much of the adjacent lands that historically supported large areas of permanent or seasonal wetlands have been converted to agriculture. Small tributaries are mostly channelized and drain into larger canals, such as the Colusa Basin Drain.

Other Local Creeks and Water Bodies

Funks Creek

Funks Creek originates at approximately 850 feet elevation in blue oak savanna in the foothills west of Antelope Valley. It flows southeast as an intermittent natural stream, where it is joined by Grapevine Creek. As it flows through the foothills and Antelope Valley, its banks are generally eroded to near-vertical slopes, the gravel bed is highly disturbed and compacted by cattle, and it is bordered by annual grassland vegetation. Little to no riparian vegetation occurs throughout much of this reach, although occasional cottonwoods, willows, or non-native species occur along the banks.

Along the north end of Antelope Valley, Funks Creek receives underground drainage from Salt Lake. Salt Lake is a 28-acre area of impounded water and seasonal alkaline wetlands formed by warm salt springs that occur upslope.

As Funks Creek cuts through the Golden Gate gap and enters the west side of the Sacramento Valley, the stream channel becomes wider although flows are still intermittent. The banks and channel have an occasional grouping of riparian trees and shrubs. Occasional wetlands occur, mainly small patches of emergent wetland or stock ponds. Approximately one mile downstream of the Golden Gate gap, Funks Creek is impounded by Funks Reservoir. This reservoir is fed mainly from waters of the T-C Canal. Downstream of the reservoir, Funks Creek is bordered by agricultural lands, and much of this reach is channelized before emptying into Stone Corral Creek. The banks are bordered by levee roads and sparsely vegetated with non-native weedy species. Occasional native or non-native riparian trees and shrubs occur along the bank, as well as small patches of emergent wetland. This portion of Funks Creek likely has some flow year round due to leakage from the dam at Funks Reservoir. A large wetland area fed by waters from agricultural canals and Funks Creek occurs upstream of the confluence of Funks Creek and Stone Corral Creek.

Stone Corral Creek

Stone Corral Creek originates at approximately 700 feet elevation in the foothills west of Antelope Valley. As the intermittent stream flows into the grasslands of Antelope Valley, the channel is narrow and the banks are eroded by streamflows to near-vertical slopes. Willows and small wetlands occur sporadically along this section of the creek. The much larger Antelope Creek flows into Stone Corral Creek from the south near the town of Sites. As Stone Corral Creek flows through the gap in the foothills and into the western Sacramento Valley, riparian vegetation increases for a few miles downstream of the community of Sites. Native and non-native species, including valley elderberries, occur along the banks.

Other Local Streams

Grapevine Creek runs along a valley west of the proposed Sites Reservoir and is a tributary to Funks Creek. It has fairly well-developed, but sporadic, riparian vegetation along its entire length. Valley elderberries are common in some areas. It is fed by numerous small ephemeral drainages.

Antelope Creek flows from the south through Antelope Valley and merges with Stone Corral Creek near the town of Sites. It is fed by numerous intermittent drainages and supports sporadic short stretches of riparian vegetation consisting of large valley oaks, Fremont cottonwoods, willows, and valley elderberries. The largest concentration of riparian habitat in the proposed reservoir occurs along Antelope Creek in the southern portion of the reservoir footprint.

Lurline Creek originates in the hills east of Antelope Valley. A small amount of seasonal wetlands and ponds occur within the basin where it originates. Narrow strips of mature willow riparian occur along stretches of the creek as it flows through the low grassy foothills.

15.3 Environmental Impacts/Environmental Consequences

15.3.1 Regulatory Setting

Wetlands and other waters of the U.S. are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

15.3.1.1 Federal Plans, Policies, and Regulations

- Clean Water Act
  - Section 401 – Discharge into Navigable Waters
  - Section 404 – Discharge of Dredged or Fill Material

- Rivers and Harbors Act of 1899
- Natural Communities Conservation Planning Act
- Executive Order 11990: Protection of Wetlands
- No Net Loss of Wetlands Policy
- Comprehensive Conservation Plans for National Wildlife Refuges

15.3.1.2 State Plans, Policies, and Regulations

- Porter-Cologne Water Quality Control Act
- Suisun Marsh Preservation Agreement
- Suisun Marsh Protection Act and Suisun Marsh Protection Plan
- Delta Vision Strategic Plan
- Delta Protection Act of 1992
- California Wetlands Conservation Policy

15.3.1.3 Regional and Local Plans, Policies, and Regulations

- Yolo Bypass Wildlife Area Land Management Plan

15.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for biological resources:

Would the Project:

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact to wetlands if it would result in any of the following:

- A substantial change in the use or quality (extent in acres or miles) of “other waters of the U.S.”, (including but not limited to lakes, rivers or streams tributary to navigable rivers, natural ponds) through direct removal, filling, obstruction, hydrological interruption, or other means. A substantial effect (significant impact) would be permanent impacts to any streams, including canals or ditches that are determined by the U.S. Army Corps of Engineers (USACE) to be jurisdictional.
- A substantial adverse effect on federally protected wetlands, as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, discharge of pollutants, or other means. A substantial effect (significant impact) would be any permanent adverse impact to any wetland.

Level of significance for flow-related impacts to wetlands and other waters of the U.S. was determined by comparing modeling results for different scenarios of the proposed operation of the alternatives (Appendix 6B and Chapter 6 Surface Water Resources). Project-related changes to the flow regime outside the range of historical variation were considered significant.

It should also be noted that any "no impact" statements in this chapter are subject to USACE jurisdictional determinations. Such jurisdictional determinations could affect the significance conclusions.

Impacts to riparian vegetation are evaluated in Chapter 13 Botanical Resources.

15.3.3 Impact Assessment Assumptions and Methodology

15.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to wetland and other waters of the U.S.:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- Borrow areas would be located within the Sites Reservoir footprint or outside the Primary Study Area from commercial sources.
- Frequent Sites Reservoir water level fluctuations would create a barren draw-down zone.

15.3.3.2 Methodology

The methodology used to determine the extents of wetlands and other waters of the U.S. potentially affected in the Extended Study Area, the extent of jurisdictional waters whose flows, quantity, seasonality, or quality may be affected by Project operations in the Secondary Study Area, and the extent of wetlands and other waters of the U.S. within the Primary Study Area is described in Sections 15.1.1.1, 15.1.2.1, and 15.1.3.1, respectively.

The Extended and Secondary study area impact assessments relied on hydrologic and operational modeling performed using CALSIM II, which provided monthly river flows, and reservoir water surface elevations derived from monthly river flows and end-of-month reservoir storages, for the period of simulation extending from water year 1922 through 2003 (82-year simulation period). Detailed discussion of the CALSIM II model is provided in Appendix 6B. These modeling results were used in combination with professional judgment to assess the potential impacts of Project operations on wetlands and other waters of the U.S.

Within the Primary Study Area, the footprints of proposed Project facilities were compared to the existing extents of wetlands and other water of the U.S. to determine direct impacts, as well as indirect impacts to immediately adjacent wetlands and other waters of the U.S.

15.3.4 Topics Eliminated from Further Analytical Consideration

Because the effects of population growth associated with the No Project/No Action Alternative would be addressed in the agricultural, municipal, and industrial water use discussions, and those issues are not relevant to jurisdictional waters and wetlands, population growth is not addressed.

The effects of operation and maintenance activities on wetlands and other water of the U.S. within the Primary Study Area are not discussed for wetlands or other waters of the U.S. that would experience permanent loss as a result of construction activities and/or inundation.

15.3.5 Impacts Associated with the No Project/No Action Alternative

15.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use and San Luis Reservoir

Impact Wet-1: A Permanent Change in the Use or Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to waters of the U.S. has been addressed in those environmental documents. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on waters of the U.S. in the Extended Study Area, when compared to Existing Conditions.

Project operational modeling indicates that Level 4 Refuge water supply would be met every year with or without the Project. Therefore, the continued reliability of Level 4 water supply **would not have a substantial adverse effect** on wildlife refuge waters, when compared to Existing Conditions.

Project operational modeling indicates that, at San Luis Reservoir, the No Project/No Action Alternative would result in the same or slightly lower water levels than for Existing Conditions during most water years. During Dry and Critical years, San Luis Reservoir water levels would be the same or slightly higher than Existing Conditions. These negligible fluctuations in surface water elevations are not expected to change the habitats, water quality, or other characteristics of this reservoir. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on waters of the U.S. at San Luis Reservoir, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. The continued reliability of Level 4 wildlife refuge water supply associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on wildlife refuge jurisdictional wetlands, when compared to Existing Conditions.

Refer to the **Impact Wet-1** discussion. Due to the negligible fluctuations in surface water elevations expected at San Luis Reservoir with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on jurisdictional wetlands that may be present at that location, when compared to Existing Conditions.

15.3.5.2 Secondary Study Area – No Project/No Action Alternative

<u>Construction, Operation, and Maintenance Impacts</u>

Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, Thermalito Complex, and Lake Natoma

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling for Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake, which are the reservoirs upstream of Lewiston Lake and Whiskeytown Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma, indicates that the No Project/No Action Alternative would result in the same or only slight changes in water levels and degrees of water level fluctuations when compared to Existing Conditions. Therefore, for these facilities, changes in water level fluctuations **would not have a substantial adverse effect** on the extent of these waters of the U.S, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the negligible fluctuations in surface water elevations expected at the listed lakes and reservoirs with implementation of the No Project/No Action Alternative,

there would not be a substantial adverse effect on jurisdictional wetlands that may be present at these locations, when compared to Existing Conditions.

Trinity River and Klamath River Downstream of the Trinity River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling results for Trinity River flows downstream of Lewiston Lake for the No Project/No Action Alternative indicate significant decreases in flow during wet water years during the months of March and April, when compared to Existing Conditions. Modeling also shows a significant increase in flows in above-normal water years in the month of February. No significant changes in flows are indicated during below-normal, dry, or critical water years. Because there would be significant changes in flows under some conditions, the No Project/No Action Alternative would have a **potentially substantial adverse effect** on waters of the U.S. on the Trinity River, when compared to Existing Conditions; these impacts would be expected to transfer to the Klamath River downstream of the Trinity River.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Because no marshes, vernal pools, or other similar wetlands have been identified along the edges of the Klamath and Trinity rivers, due to the steep slopes and rapid flows in these rivers, the No Project/No Action Alternative **would not have a substantial adverse effect** on jurisdictional wetlands along these rivers, when compared to Existing Conditions.

Spring Creek

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling was not performed for Spring Creek. However, if the No Project/No Action Alternative is implemented, Whiskeytown Lake and Keswick Reservoir are expected to continue to operate as regulating reservoirs, and therefore, would not be expected to affect the released flows that dilute Spring Creek runoff. Because no change in the dilution of Spring Creek runoff is expected, **there would not be a substantial adverse effect** on waters of the U.S. at Spring Creek, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the lack of fluctuation in flows expected in Spring Creek with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse**

effect on jurisdictional wetlands that may be present at that location, when compared to Existing Conditions.

Sacramento River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

On the Sacramento River, Project operational modeling indicates that, if the No Project/No Action Alternative is implemented, flows downstream of Keswick Reservoir, at Bend Bridge, downstream of RBDD, and downstream of Hamilton City would experience minimal changes. Flows downstream of Keswick Reservoir would experience a decrease in November flows in dry years. Impacts to Sacramento River waters of the U.S. **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the negligible fluctuations in flows expected in the Sacramento River with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on the few jurisdictional wetlands that may be present along the river, mostly in backwater or side-channel areas, when compared to Existing Conditions.

Clear Creek

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

If the No Project/No Action Alternative is implemented, Project operational modeling indicates an overall small change in Clear Creek flows (flows downstream of Whiskeytown). This would be due to almost no change in wet, above-normal, below-normal, and dry water year flows, but large increases in flows in critically dry years. The large changes in critically dry years could result in an impact to waters of the U.S. in Clear Creek that **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the net small fluctuation in flows expected in Clear Creek with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on the few jurisdictional wetlands that may be present along this Creek (mostly in backwater or side-channel areas), when compared to Existing Conditions.

Feather River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling for the Feather River (flows downstream of the Thermalito Complex) for the No Project/No Action Alternative indicates August-September increases in wet years and an August increase in above-normal years. In below-normal years, there would be increases in October and June, and decreases in November and February. In dry years, flows would decrease in August, October, and January-March, and increases in December and June. Critically-dry years would result in decreases in November-December and July, and increases in August-September. Because there would be substantial changes in flows under many conditions, the No Project/No Action Alternative **would have a potentially substantial adverse effect** on waters of the U.S. on the Feather River, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Because no marshes, vernal pools, or other similar wetlands have been identified along the edges of the Feather River, due to steep slopes and rapid flow, the No Project/No Action Alternative **would not have a substantial adverse effect** on jurisdictional wetlands along this river, when compared to Existing Conditions.

Sutter Bypass

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling for the Sutter Bypass for the No Project/No Action Alternative indicates the following alterations compared to existing flow regimes:

- Moulton Weir Spills into Sutter Bypass – small overall change; decrease in spills in December of wet years; large increase in December of dry years
- Ord Ferry Spills into Sutter Bypass – almost no overall change, but large decrease in December in wet years and large increase in December in critical years
- Colusa Weir into Sutter Bypass – overall decrease in November; very large decrease in dry years; major changes in below normal years; large January increase in dry and critical years
- Tisdale Weir into Sutter Bypass – very small overall change; increase in February in below-normal years; decrease in November in dry water-years

Because there would be substantial changes in flows into Sutter Bypass during several water-year conditions compared to existing flow regimes, the No Project/No Action Alternative **would have a**

potentially substantial adverse effect on waters of the U.S. in the Sutter Bypass, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Because there would be substantial changes in flows into Sutter Bypass during several water-year conditions compared to existing flow regimes, the No Project/No Action Alternative **would have a potentially substantial adverse effect** on jurisdictional wetlands that may exist in parts of the Sutter Bypass, when compared to Existing Conditions.

Yolo Bypass

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling indicates that, if the No Project/No Action Alternative is implemented, the Yolo Bypass would experience only a slight overall change in monthly flow compared with existing flow conditions, but in below-normal and dry years there would be a large late-fall decrease in flows. Therefore, the No Project/No Action Alternative's large decreases in critically dry years **would have a substantial adverse effect** to waters of the U.S. in the Yolo Bypass, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Because there would be substantial changes in flows into Sutter Bypass during Dry and Below Normal water year conditions compared to existing flow regimes, the No Project/No Action Alternative **would have a potentially substantial adverse effect** on jurisdictional wetlands that may exist in parts of the Yolo Bypass, when compared to Existing Conditions.

American River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling for the American River (flows downstream of Nimbus Dam) indicates that, if the No Project/No Action Alternative is implemented, there would be an overall decrease in flows in all months except for December. There would also be a large decrease in September of above-normal years and in September-October of below-normal years, and in August-September in critically dry years. Due to such large changes in seasonal flows with the No Project/No Action Alternative when compared to Existing Conditions, **there would be a substantial adverse effect** on waters of the U.S. in the American River.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the decreases in flows expected in the American River with implementation of the No Project/No Action Alternative, **there would be a potentially substantial adverse effect** on the few jurisdictional wetlands that may be present along the river (mostly in backwater or side-channel areas), when compared to Existing Conditions.

Sacramento-San Joaquin Delta

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

If the No Project/No Action Alternative is implemented, Project operational modeling indicates an overall minimal change in Delta monthly outflow, when compared to existing flows. It also indicates a decrease in August outflows in wet years, a decrease in October flows, and an increase in July flows in below-normal years. Therefore, with the No Project/No Action Alternative, **there would not be a substantial adverse effect** to Delta waters of the U.S, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the minimal fluctuations in flows expected in the Delta with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on jurisdictional wetlands present at that location, when compared to Existing Conditions.

Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling indicates a negligible change in the X2 position if the No Project/No Action Alternative is implemented. Therefore, **there would not be a substantial adverse effect** from the No Project/No Action Alternative to waters of the U.S. in the Delta and Suisun, San Pablo, San Francisco Bays, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the negligible change in flows or the salinity gradient expected in the Suisun, San Pablo, or San Francisco Bays with implementation of the No Project/No Action Alternative, **there would not be a substantial adverse effect** on jurisdictional wetlands present at those locations, when compared to Existing Conditions.

15.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Projects included within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **would not have a substantial adverse effect** on waters of the U.S. in that area, when compared to Existing Conditions. However, current land use practices in the Primary Study Area would continue. On grazing lands in and surrounding the Sites Reservoir footprint, existing levels of ongoing impacts, such as discharge, use by cattle, erosion, obstruction from debris, and other by-products of rural life are expected to continue at their current levels. In agricultural lands to the east of the Golden Gate Dam site, canals, channelized creeks, and the Sacramento River across from Moulton Weir are expected to continue to experience similar flows and uses as they currently do (i.e., Existing Conditions). Therefore, **there would not be a substantial adverse effect** from the No Project/No Action Alternative to waters of the U.S. in the Primary Study Area, when compared to Existing Conditions.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion.

15.3.6 Impacts Associated with Alternative A

15.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Wildlife Refuge Water Use

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

To meet the established requirement to supply the target of 555,515 acre-feet of water to the wildlife refuges (Level 4), pursuant to CVPIA, the refuges would be supplying the same amount of water to their wetlands regardless of the Project operations. Therefore, there would be **no impact** on waters of the U.S., when compared to Existing Conditions or the No Project/No Action Alternative, within the wildlife refuges from differences in the source of their water supply as a result of Project operations.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

As indicated in the **Impact Wet-1** discussion, the wildlife refuges would be supplying the same amount of water to their wetlands regardless of the Project operations. Therefore, the perennial wetland resources in the eleven potentially affected wildlife refuges and wildlife areas would experience **no impact** on federally protected wetlands, when compared to Existing Conditions and the No Project/No Action Alternative, from differences in the source of their water supply as a result of Project operations.

San Luis Reservoir

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling indicates that Project operations would result in larger and more frequent fluctuations in water levels in San Luis Reservoir, in certain types of water years. This effect would slightly exceed the existing height or extent of the draw-down zone at San Luis Reservoir in some very dry years. Because the fluctuations would remain very close to the historic range of variability, and because operating the Project would not introduce pollutants, fill material, or obstructions to this water body, the impact of Project operations on the waters of San Luis Reservoir is considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Although small wetlands occur at some seeps in drainages feeding San Luis Reservoir, these small wetlands in the drawdown zone have their own water sources and are independent of water levels in the reservoir. Therefore, **no impact** to wetlands would occur as a result of the increased San Luis Reservoir fluctuations associated with the Project, when compared to Existing Conditions and the No Project/No Action Alternative.

15.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, and American River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling in all of the above waters indicates that Project operations would not result in water levels higher or lower than historic levels. For lakes and reservoirs, Project operations would cause no discernible differences in water levels, mostly reducing the extent of fluctuation extremes. For rivers in general, a total of 668 miles of rivers downstream of dams would be potentially affected; however, this impact would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative. For the Feather and American rivers in particular, Project operation would have the indirect effect of dampening the extremes of flows to make the rivers' flows more closely resemble natural conditions, correlating with local hydrological conditions. Because water levels would remain within historic ranges of variation, and would have a steadying effect on the artificially fluctuating water levels that occur during Existing Conditions, the impact of the Project operation on all of the above waters would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the minimal fluctuations in flows expected in the above-listed waters with implementation of Alternative A, there would be a **less-than-significant impact** on jurisdictional wetlands present at those locations, when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling using the Sacramento River Ecological Flow tool (SacEFT) (Appendix 8B) indicates that Project operations would indirectly result in changes in river flows downstream of the GCID Canal, Red Bluff Pumping Plant, and proposed Delevan Pipeline intakes for Sites Reservoir. However, the changes would be slight when compared to Existing Conditions. There would be no change in the frequency or severity of flood event flows. These slight changes in flows would represent a **less-than-significant impact** on the waters of the Sacramento River, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump Installation at the Red Bluff Pumping Plant

The construction activities associated with pump installation at the Red Bluff Pumping Plant, and its operation and maintenance, would not affect levels of waters other than the Sacramento River immediately downstream of the pumping plant. Transportation of necessary equipment to install the pump (including a crane) would occur along existing construction or access roads. Dewatering of the afterbay would likely be required, and could occur during regularly scheduled maintenance periods or during the non-irrigation season. Therefore, construction and maintenance is not expected to involve any disturbance that would result in a loss or alteration of the river environment. Operations of the pump would increase the rate of diversion from the river by up to 250 cfs. An increase of such a small amount is not expected to adversely affect the aquatic environment downstream of the diversion. Therefore, the modification of the existing flow regime resulting from the operation of an additional pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on Sacramento River waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Minimal fluctuations in flows are expected in the Sacramento River with implementation of Alternative A from the installation, operation, and maintenance of a pump at the existing Red Bluff Pumping Plant. Because changes in flows would be minimal, there would be a **less-than-significant impact** on jurisdictional wetlands present along the edges of the river (most likely in backwater or slough locations), when compared to Existing Conditions and the No Project/No Action Alternative.

Sacramento-San Joaquin Delta and Suisun Bay

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling indicates that Project operations would increase the flow through the Delta in summer and fall, and in very dry years. This change in flow is not contrary to the Biological Opinion for delta smelt. Therefore, there would be a **less-than-significant impact** on waters of the U.S. in the Delta, when compared to Existing Conditions and the No Project/No Action Alternative.

In December and January, Project operations would result in a reduction in flows through the Delta, which would result in a 1 to 2 kilometer westward movement of the salinity/freshwater edge line, or "X2", increasing salinity in Suisun Bay in early spring. This shift would be located substantially to the west of the mandated standard location of X2, and would fall within the historical range of species tolerance. Similarly, modeling indicates that the diversions associated with the Project would substantially increase electrical conductivity (EC) (which is a measure of changes in salinity) in the Suisun Marsh in December. However, this would occur when EC is at its lowest annual level, and this increase would fall within the historical range of species tolerance. Modeling also indicates an improvement in salinity conditions in August through October, and increased inflows into the Delta during critically dry years. Because the salinity changes would be within historic ranges of variation, there would be a **less-than-significant impact** on Delta-Suisun Bay waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Because alterations in flows and salinities expected in the Delta-Suisun Bay with implementation of Alternative A would be within the historical range of species tolerance in winter, and actually improved during Dry conditions, there would be a **less-than-significant impact** from Alternative A on jurisdictional wetlands present in the Delta and Suisun Marsh, when compared to Existing Conditions and the No Project/No Action Alternative.

San Pablo Bay and San Francisco Bay

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers,

Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Project operational modeling indicates that the effect of Project operations would not reach as far as San Pablo or San Francisco Bay, and would, therefore, result in **no impact** on these waters, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion.

15.3.6.3 Primary Study Area – Alternative A

<u>Construction, Operation, and Maintenance Impacts</u>

An evaluation of the potential construction, operation, and maintenance impacts to wetlands and other waters of the U.S. resulting from implementation of Alternative A is discussed below.

Sites Reservoir Inundation Area and Sites Dams

Ground disturbance associated with dam construction, as well as inundation of the 1.27-MAF Sites Reservoir, would have a permanent adverse impact on existing wetlands and other waters of the U.S. due to removal and replacement by standing water, sterile subsoil, or permanent facilities. The acres of wetlands or other waters of the U.S. that would be affected by the1.27-MAF Sites Reservoir and its associated dams are listed in Table 15-7. Ponds are considered separately from wetlands or tributary streams.

Table 15-7
Direct Loss of Wetlands and Other Waters of the U.S. due to the Construction of the 1.27-MAF Sites Reservoir Inundation Area and Dams

Wetland or Other Waters of the U.S. Type	Number of Acres Affected	Number of Miles Affected*
Alkaline	19.2	
Emergent	2.4	
Riparian	21.5	
Seasonal	153.1	
Vernal pool	4.3	
Total Wetlands	**200.6**	
Tributaries 0 to 15 Feet Wide (smaller tributaries)	77.0	123.0
Tributaries >15 Feet Wide (major tributaries)	82.0	25.0
Total Other Waters of the U.S.	**159.0**	**148.0**
TOTAL PONDS	**20.2**	
Salt Lake	6.1	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

During construction of the dams, a cofferdam would be installed upstream of the Sites and Golden Gate damsites around the dams' construction work areas to retain storm flows entering the reservoir basin from Funks Creek and Stone Corral Creek. Funks Creek flows would not be maintained between the Golden Gate damsite and the existing Funks Reservoir during the construction period. The reach of Funks Creek that would be temporarily dewatered during construction would be approximately 1.4 miles long. However, Funks Creek flows would be maintained downstream of Funks Reservoir during the entire construction period. Therefore, the temporary dewatering of Funks Creek upstream of Funks Reservoir would be a **less-than-significant impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Diverted Funks Creek flows would pass through a pipe at the Sites Dam site and would continue downstream into Stone Corral Creek. Construction of the dams, as well as the filling of Sites Reservoir, would result in the direct permanent loss of a total of 148 miles (175 acres) of waters of the U.S. These waters consist of 25 miles (82 acres) of major tributaries, 123 miles (77 acres) of smaller tributaries, and 20 acres of ponds (Table 15-7) (DWR, 2000). Major tributaries are considered to be stream reaches more than 15 feet in width; minor tributaries are less than 15 feet wide. Most of the streams are associated with Antelope, Grapevine, Funks, and Stone Corral creeks. The streams are mostly very minor ephemeral drainages, and the more major tributaries are also quite disturbed. However, the loss of these streams, especially the 82 acres of major tributaries, could be considered a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation, releases from Sites and Golden Gate dams would maintain flows of up to 10 cfs from October through May in Stone Corral and Funks creeks, respectively, to mimic the ephemeral nature of these streams. Because these flows would be maintained close to natural levels, the impact to waters of the U.S. would be **less than significant**.

Periodic maintenance activities, and debris and vegetation removal from the dam embankments, could result in temporary increases in sedimentation or organic matter in downstream Stone Corral and Funks creeks. However, Best Management Practices (BMPs) should minimize this effect, resulting in a **less-than-significant** impact on waters of the U.S.

Ponds

Due to their disturbed and artificial nature, and because stock ponds are generally not jurisdictional (USACE, 2011a), the permanent loss of 28 small stock ponds due to construction and filling of Sites Reservoir would have *no impact* ***on waters of the U.S, when compared to Existing Conditions and the No Project/No Action Alternative. Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means***

Seasonal Wetlands

Construction and operation of the 1.27-MAF reservoir would result in the permanent loss of approximately 153 acres of seasonal wetlands through initial inundation and repeated water level fluctuations. These 97 wetlands are mostly small areas associated with low-lying swales, valley bottoms, or shallow drainages, especially in clay-dominated soils. More than half of these wetlands are smaller than one acre in size; 29 are between one and five acres, and eight are larger than five acres. Seasonal wetlands lost to inundation include nearly 12 acres associated with Salt Lake; some of these may be at least partially saline. Because the wetlands of the western edge of the Sacramento Valley are already much reduced in number, the loss of these potentially jurisdictional seasonal wetlands (especially because they include some partly alkaline or saline features) would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Alkaline Wetlands

Construction and inundation of a 1.27-MAF Sites Reservoir would result in the permanent direct loss of more than 19 acres of alkaline wetlands, all associated with the six-acre saline spring-fed Salt Lake impoundment. These seasonal wetlands are separate from the 12 acres of seasonal (non-alkaline) wetlands discussed above. More than 15 acres are located in the same drainage as Salt Lake (directly upstream or downstream), and four additional acres of alkaline wetland are located in the adjacent drainage to the east. This unique habitat includes muds so high in mineral salts that no vegetation becomes established; salt- and alkali-tolerant species are supported in narrow strips around its edges. The saline/alkaline wetland surrounding Salt Lake represents the single largest wetland within the Sites Reservoir footprint. No alkaline wetlands were mapped in any other portions of the reservoir footprint. Although historically abundant in the western edges of the Sacramento Valley, the alkaline (or saline/ alkaline) wetland type is no longer common in the Project region due to extensive conversion of land to large-scale agricultural fields. Loss of the Salt Lake pond (6 acres) and alkaline wetland complex (19 acres), totaling 25 acres, would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Vernal Pools

If Alternative A is implemented, the construction and inundation of Sites Reservoir would also permanently destroy more than four acres of vegetated vernal pools, many of which are either artificially created impoundments or highly disturbed/degraded by long-term heavy grazing. These 16 vernal pools are distributed throughout the reservoir footprint in Antelope Valley. The largest pool (more than 1.3 acres) is associated with Salt Lake. The remaining features are all smaller than one acre in size. Most of the vernal pools within the reservoir footprint are highly degraded. However, because vernal pools of the western edge of the Sacramento Valley are already much reduced in number, the loss of these vernal pools within the Sites Reservoir Inundation Area (especially because they include some partly alkaline or saline features) would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Emergent Wetlands

Approximately 2.4 acres of emergent wetlands would be permanently lost through construction and inundation of Sites Reservoir if Alternative A is implemented. These wetlands consist of two areas impounded by Peterson Road in the north part of the reservoir footprint; one (1.6 acres in size) is spring-fed. Although these features are small and disturbed by cattle, such wetlands are sensitive features and part of a large swale complex draining the coast range foothills, and their loss would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Riparian Wetlands

More than 21 acres of riparian wetlands were mapped and identified within the reservoir footprint for Alternative A. These riparian wetlands would be permanently lost through construction and filling of Sites Reservoir. Most of these 15 mapped areas are one acre or smaller in size, and consist of sparse wetland vegetation within disturbed intermittent stream channels. However, the loss of these riparian wetlands due to construction and inundation could be considered a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

The recreation areas at Sites Reservoir would include the five proposed recreation area footprints and the electrical distribution lines[2] needed to supply electricity to four of the recreation areas (Antelope Island would not have electricity). The construction of boat ramps, picnic tables, fire rings, gravel roads, vault toilets, and garbage dumpsters within the recreation areas would result in direct impacts to existing wetlands and other waters of the U.S. Waters could be permanently lost or adversely affected due to development of facilities at the sites.

Indirect impacts to wetlands or other waters of the U.S. could include siltation, erosion, and habitat degradation due to mechanical disturbance from incidental or accidental off-road driving, foot traffic, and other disturbance by visitors and their pets that could occur during Project operation and maintenance.

Because the exact location and area affected by construction is not currently known, total loss of existing ponds and other waters of the U.S. from recreation area footprints is expected. The maximum acres of wetlands or other waters of the U.S. expected to be lost or affected within each recreation area are listed in Table 15-8. This loss represents the maximum acreage; the actual direct loss of waters would likely be less, and most of the impacts would be indirect.

Impacts to waters from the distribution lines that would serve the recreation areas would all be temporary impacts of disturbance during the construction period only, with very small areas permanently occupied by the poles during Project operation.

[2] The roads to each of the recreation areas are addressed in the Road Relocations and South Bridge discussion.

Table 15-8
Direct Loss of Wetlands and Other Waters of the U.S.
Due to the Construction of the Recreation Areas

Wetland or Other Waters of the U.S. Type	Number of Acres/Miles Lost by Recreation Area					All Recreation Areas
	Saddle Dam	Peninsula Hills	Stone Corral	Antelope Island	Lurline Headwaters	
Seasonal Wetlands	13.30 acres	0	0	0	0	13.30 acres
Total Wetlands	**13.30 acres**	**0**	**0**	**0**	**0**	**13.30 acres**
Tributaries 0 to 5 Feet Wide	0.72 acre/ 2.91 miles	0.99 acre/ 3.82 miles	0.78 acre/ 2.25 miles	0.03 acre/ 0.15 mile	0.22 acre/ 0.97 mile	2.74 acres/ 10.1 miles
Tributaries 5 to 10 Feet Wide	0.22 acre/ 0.34 mile	0.02 acre/ 0.03 mile	0	0	0	0.24 acre/ 0.37 mile
Tributaries > 15 Feet Wide	0	0	0	0	0	0
Total Other Waters of the U.S.	**0.94 acre/ 3.25 miles**	**1.01 acres/ 3.85 miles**	**0.78 acre/ 2.25 miles**	**0.03 acre/ 0.15 mile**	**0.22 acre/ 0.97 mile**	**2.98 acres/ 10.47 miles**
Total Ponds	**1.24 acres**	**0**	**0**	**0**	**0.04 acre**	**1.28 acres**

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

Approximately three acres (10.5 miles) of streams could be permanently lost or permanently degraded by construction and operation of the five recreation areas. These waters consist mostly of numerous short sections of intermittent small natural tributaries (mostly less than five feet in width) in all five areas. No streams greater than 10 feet wide would be lost or affected. In some recreation areas, the majority of these small stream segments are located at upper ends of very steep drainage channels that are very unlikely to be included in facility development. However, in the Stone Corral Recreation Area, some tributaries to Stone Corral Creek are on gentler slopes and could be directly affected. This is also true of the several tributaries to Funks Creek in the Peninsula Hills Recreation Area and some of the tributaries to Hunters Creek in the Saddle Dam Recreation Area. The streams in the Saddle Dam Recreation Area connect the many seasonal wetlands in that vicinity. In addition, because headwaters are involved in almost every case, all of the streams are vulnerable to impacts of erosion and siltation due to construction and other upslope human activities that would occur in the recreation areas during Project operation and maintenance. Despite the ephemeral nature of most of these streams, loss or adverse effects to streams within the recreation areas would be considered a substantial effect on waters of the U.S. The combined length of more than ten miles, and the connection of several streams with wetland features, mostly in the Saddle Dam Recreation Area, would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The corridor for the distribution lines that would serve the recreation areas would cross 0.06 acre (0.11 mile) of streams, which could result in minor temporary impacts during construction and potential direct impacts from placement of electrical poles. However, poles could be placed to avoid these stream crossings. Operation of these distribution lines would be an unmanned activity and have no associated on-the-ground disturbance. Maintenance activities, including equipment inspections and vegetation maintenance, could also be performed to avoid any effects to these stream crossings. Due to the minor extent of streams that could be affected and the ease of avoiding the streams, this would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Ponds

Approximately 1.2 acres of ponds (a total of five ponds) could be destroyed or substantially disturbed by construction of three of the recreation areas. Indirect disturbance from recreational use during Project operation, as well as from maintenance activities, including road grading and vegetation control, could also occur. All are stock ponds that are smaller than one acre in size, and vary in the amount of emergent or other wetland vegetation they support. Most have little to no vegetation because they are very disturbed by cattle trampling. No ponds would be affected by construction within the corridors of the distribution lines that would serve any of the recreation areas. Direct loss, disturbance during construction, or indirect disturbance from operation and maintenance activities, of 1.2 acres of stockponds would constitute **no impact** to waters of the U.S. due to their small size, disturbed state, minimal vegetation, and agricultural stockpond status (USACE, 2011a), when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Seasonal Wetlands

Approximately 13 acres of seasonal wetlands could be permanently lost or otherwise affected by construction, operation, and maintenance of the recreation facilities within the Saddle Dam Recreation Area. This acreage includes approximately 0.2 acre of seasonal wetlands within the north end of the construction disturbance area for the electrical distribution line that would serve this recreation area. Although not mapped as alkaline wetlands, these seasonally wet areas are at or near the headwaters of some of the watersheds feeding off-site alkaline wetlands. It is possible that some of the wetlands in the Saddle Dam Recreation Area could support alkaline wetland species, and these habitats could be lost or affected by construction, operation, or maintenance activities in this area. Although a portion of these 13 acres would probably not be affected or may be subjected to only temporary or short-term impacts during construction, it is expected that they would be lost or adversely affected by use of recreational facilities during operation or during maintenance activities, including road grading and vegetation control. Because seasonal wetlands are potentially jurisdictional wetlands, their loss or disturbance would be a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

The Road Relocations and South Bridge would include portions of the existing Huffmaster, Maxwell Sites, Sites Lodoga, and private property roads; new access roads to facilities, such as recreation areas and dams; connections between existing and new roads; and an approach to a new bridge (Figure 3-1 in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives).

The 200-foot-wide construction buffer includes the surface areas of paved roads, gravel roads, the associated shoulders and cut-and-fill slopes, and some additional area. Both sides of the roads are proposed to be fenced. Because exact locations of construction-related activities are not known, construction of the roads is expected to result in direct permanent loss of existing waters of the U.S. within the entire construction disturbance area. An unknown portion of these impacts would actually be temporary if the waters were avoided or restored after construction. However, once a stream is severely disturbed or impacted, its hydrology may be permanently altered, resulting in a permanent impact even if the feature still exists after construction. The maximum extent (in acres and miles) of wetlands or other waters of the U.S. that would be affected by construction of the Road Relocations and South Bridge is shown in Table 15-9.

Table 15-9
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Road Relocations and South Bridge

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
Alkaline wetlands	1.14	
Emergent wetlands	0.04	
Seasonal wetlands	4.21	
Vernal pools	0.03	
Total Wetlands	**5.42**	
Tributaries 0 to 5 Feet Wide	2.05	6.0
Tributaries 5 to 10 Feet Wide	4.02	4.44
Tributaries10 to 15 Feet Wide	1.15	0.80
Tributaries > 15 Feet Wide	2.22	0.58
Total Other Waters of the U.S.	**9.44**	**11.8**
Total Ponds	**0.484**	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

A total of more than 9.4 acres (or approximately 11.8 miles) of streams could suffer permanent adverse impacts from road construction. These streams consist mostly of numerous short sections of intermittent small tributaries (many smaller than five feet in width) in all road segments, with substantial additions from some larger stream crossings in a few segments. The largest potential impacts to other waters of the U.S. are the crossings by Eastside Road, where it would cross Funks Creek (>15 feet wide) and its tributaries. One Funks Creek tributary crossing in this segment, and another in the Stone Corral Road segment, support riparian trees. The next largest losses of streams are the crossings of creeks that are five to 10 feet wide by Saddle Dam Road and Lurline Road. Streams crossed by Saddle Dam Road (the North Road segment) are tributaries to Hunters Creek, and streams crossed by Lurline Road (the Huffmaster Road to Lurline Road segment) are tributaries to Antelope or Lurline creeks off the southeast end of the reservoir. Although most stream crossings would be very small, the collective loss of these streams would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Vehicle use associated with operation of the roads would be confined to the defined road and shoulder areas due to continuous roadside fencing and/or guardrails. Therefore, operation of the roads would be expected to result in a **less-than-significant impact** on waters of the U.S.

Disturbance from maintenance activities, such as road repair, embankment erosion repair, and vegetation control, could result in increased sedimentation and organic matter entering adjacent streams. However, BMPs should minimize this effect, resulting in a **less-than-significant** impact on waters of the U.S.

Ponds

Construction of the Road Relocations and South Bridge could also result in the direct loss of nearly 0.5 acre of ponds, in locations between Golden Gate Dam and Funks Reservoir, and also along the Lurline Road to the Communication Tower segment of Com Road, off the southeast edge of the Sites Reservoir footprint. One small pond would also be intersected by the construction disturbance area of the Road 69 segment, east of Eastside Road. Indirect disturbance could also occur during operation or maintenance of the roads. No other ponds would be crossed by any other segment of the roads. These ponds are all very small stockponds, artificially created (dammed) and disturbed, with minimal associated vegetation, except for some vegetation associated with the pond at the head of Lurline Road. Their loss or disturbance would constitute **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Seasonal Wetlands

If Alternative A is implemented, approximately 4.2 acres of seasonal wetlands could be permanently lost or otherwise impacted by construction of the Road Relocations and South Bridge and the associated cut and fill areas. More than one acre would be lost within the Saddle Dam Road, and approximately two acres along Road 69 approaching its intersection with Saddle Dam Road. Comprised of four separate crossings, these wetlands are located approximately one to two miles directly north of the Salt Lake complex of alkaline wetland features. Although not mapped as alkaline wetlands, the wetlands intersected by these road segments are at or near headwaters of some of the watersheds feeding alkaline wetlands off the northeast edge of the Sites Reservoir footprint. It is possible that some of the seasonal wetlands crossed by the Saddle Dam Road and intersected by the Road 69 widening could support alkaline wetland species, and portions of these habitats could be lost or affected by construction in this area. Approximately 0.8 acre of seasonal wetlands would also be permanently lost due to construction of the Sulphur Gap Road (Maxwell Sites Road to Lurline Road segment) portion of the route. Indirect disturbance could also occur during operation or maintenance of the roads. No mapped seasonal wetlands would be lost or directly affected in any of the other parts of the road relocations. Although seasonal wetlands can be considered jurisdictional features, these small wetlands can be easily avoided by relocation of the route, so their loss is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Alkaline Wetlands

If Alternative A is implemented, construction of the Road Relocations and South Bridge could result in the direct loss of approximately 1.14 acres of alkaline wetlands along the Road 69 at T-C Canal to Saddle Dam Road segment of the North Road, located northeast of the Sites Reservoir footprint. At this location, the construction disturbance area overlaps with closely adjacent seasonal and alkaline wetlands and has high potential for impacts to these wetlands. Indirect disturbance could also occur during operation or maintenance of the roads. No other alkaline wetlands are crossed by other segments of the Road Relocations and South Bridge. In this part of the Sacramento Valley, remnant alkaline wetlands have mostly disappeared due to agriculture, so loss of any remaining alkaline wetlands would be a potentially substantial adverse effect; however, because these features are relatively easily avoided by rerouting the road corridor, their loss is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Vernal Pools

If Alternative A is implemented, construction of the Road Relocations and South Bridge could also result in the direct loss of 0.03 acre of vernal pools along the North Road (Road 69 at T-C Canal to Saddle Dam Road segment), located northeast of the Sites Reservoir footprint. This small acreage would result from an overlap of the construction disturbance area with a series of ten small vernal pools ranging from 12 to 20 feet in diameter. Indirect disturbance could also occur during operation or maintenance of the roads. No other vernal pools would be crossed by other segments of the Road Relocations and South Bridge. Because these five small vernal pools represent half of all the vernal pool features mapped in this part of the Primary Study Area, and vernal pools are a sensitive resource, loss of or impact to these vernal pools near Road 69 would be a potentially substantial adverse effect; however, because these features are relatively easily avoided by rerouting the road corridor, their loss is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Emergent Wetlands

Alternative A construction of the Road Relocations and South Bridge could result in the direct loss of 0.04 acre of emergent wetlands along the North Road (Road 69 at T-C Canal to Saddle Dam Road segment), located northeast of the Sites Reservoir footprint. This small acreage would result from an overlap of the construction disturbance area with a stream channel aligned south of Road 69, approximately 0.5 west of the T-C Canal. This 390-foot-long emergent wetland is in a stream channel, and is therefore, also a riparian wetland. It is associated with other waters of the U.S. Indirect disturbance could also occur during operation or maintenance of the roads. Its loss or disturbance resulting from road construction would be a potentially substantial adverse effect; however, because these features are relatively easily avoided by rerouting the road corridor, their loss is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

The Sites Reservoir Inlet/Outlet Structure and four adjacent facilities would be located between Logan Ridge (location of the dams) and Funks Reservoir. The footprints of these facilities represent the area of permanent disturbance; temporary disturbance would also occur within the construction disturbance area. Because exact locations of construction-related activities are not known, construction of the Inlet/Outlet facility group is expected to result in the direct permanent loss of existing waters of the U.S. within the entire combined footprint. A portion of these impacts would be temporary if the wetland or waters were avoided or restored after construction. However, once a wetland or stream is severely disturbed or impacted, its hydrology may be permanently altered, resulting in permanent impact even if the feature still exists after construction. The acres of each type of waters of the U.S. that would be lost or adversely affected within the Sites Inlet/Outlet facility group footprint are summarized in Table 15-10. No wetlands exist at the Sites Inlet/Outlet facility group location. The construction disturbance area for this facilities group lies within the approximately 1,000-acre construction disturbance area for the Sites Reservoir/dam facilities. Construction-related ground disturbance for the Inlet/Outlet structure facilities occurring in this construction disturbance area would be temporary, and disturbed areas would be returned to their original condition following completion of construction.

Table 15-10
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
Seasonal wetlands	0	
Total Wetlands	**0**	
Tributaries 0 to 5 Feet Wide	0.31	0.61
Tributaries 5 to 10 Feet Wide	0.58	0.49
Tributaries10 to 15 Feet Wide	0	0
Tributaries > 15 Feet Wide	0.53	0.08
Total Other Waters of the U.S.	**1.42**	**1.19**
Total Ponds	**0.2**	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

If Alternative A is implemented, approximately 1.4 acres (or approximately 1.2 miles) of streams could experience permanent adverse impacts from the construction of these facilities. Some of these streams consist of sections of intermittent small tributaries that are smaller than five feet in width within the Field Office Maintenance Yard footprint. However, crossings of Funks Creek and its tributaries by the Sites Reservoir Inlet/Outlet Structure account for larger areas of impact to waters of the U.S., because these streams are 15 feet or larger in width. The largest potential impacts to other waters of the U.S. would be the crossings at the center of the Inlet/Outlet Structure, where the facility would cross Funks Creek (greater than 50 feet wide). One Funks Creek tributary crossing in this segment supports riparian trees. The Inlet/Outlet Structure would also cross the northwest end of Funks Reservoir, which is from 60 to 130 feet wide and accounts for approximately 1.3 acres of waters. Although the acreage of disturbed streams is small, the permanent disturbance to Funks Creek during construction of the Sites Reservoir Inlet/Outlet Structure would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Ponds

Construction of the Outlet concrete and excavation components of the Sites Reservoir Inlet/Outlet Structure facility group would result in the direct loss of approximately 0.2 acre of one pond, located west of Funks Reservoir. This pond is a stockpond, artificially created (dammed) as part of the nearby ranching operation, very disturbed, and devoid of associated vegetation. Its loss or disturbance would have **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

No wetlands occur within the footprint of these facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The Holthouse Reservoir Complex includes the existing Funks Reservoir, the proposed Holthouse Reservoir, and these connected facilities: the dam, spillway and stilling basin, pumping plant, electrical switchyard, T-C Canal discharge dissipater, Funks bypass pipeline, and discharge pipeline to the T-C Canal. The footprints of these facilities represent the ground area they would occupy once built plus the temporary disturbance area within the construction disturbance area of the Holthouse to T-C Canal discharge pipeline. The construction disturbance area for the remainder of the Holthouse Reservoir facilities is expected to be located within adjacent agricultural land. Construction of the proposed facilities within the Holthouse Reservoir Complex would result in the direct permanent loss of wetlands or other waters of the U.S. within the entire combined footprint. The number of acres of each type of other waters of the U.S. that would be lost or adversely affected within the Holthouse Reservoir Complex proposed footprint is summarized in Table 15-11.

Table 15-11
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard[a]

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost[b]
Alkaline wetlands	Direct: 0.5 Possible Indirect: 13.0 to 40.0	
Total Wetlands	**Direct: 0.5 Possible Indirect: 13.0 to 40.0**	
Tributaries 0 to 5 Feet Wide	0	0
Tributaries 5 to 10 Feet Wide	0.30	0.29
Tributaries 10 to 15 Feet Wide	0.46	0.26
Tributaries > 15 Feet Wide	5.04	0.87
Total Other Waters of the U.S.	**5.8**	**1.4**
Total Ponds	**0**	

[a]Acreage of existing Funks Reservoir not included,

[b]Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

A total of nearly six acres (or approximately 1.4 miles) of tributaries would be permanently lost through construction of these facilities and inundation of Holthouse Reservoir. Some (one acre/0.6 mile) of these streams consist of agricultural ditches (between eight and 32 feet wide) that traverse the agricultural areas between the T-C Canal and north of Funks Creek within the Holthouse Reservoir and Dam footprints. Loss of these ditches, which were dug through upland areas to irrigate nearby fields, would constitute **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. However, inundation of Funks Creek by the Holthouse Reservoir and Dam accounts for more substantial areas of impact to waters of the U.S., because Funks Creek downstream of the existing dam outlet ranges from 40 to 120 feet or more in width. One of the largest potential impacts to other waters of the U.S. is the inundation of the two-acre riparian area supported by Funks Creek downstream of the existing dam outlet, where Funks Creek averages more than 80 feet wide. The remaining length (approximately 0.8 mile or five acres) of the Funks Creek channel supports a narrow strip of mature riparian trees that would be lost to construction of these facilities. The permanent loss to this stretch of Funks Creek waters resulting from construction and inundation would be a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Ponds

The proposed dredging of the existing Funks Reservoir would involve draining the reservoir for two years. This dredging would represent special maintenance to return the facility to original design capacity, which is beyond the annual maintenance that is already conducted. Funks Reservoir is an impoundment of Funks Creek (in part); Funks Creek is considered a water of the U.S.; Funks Reservoir is, therefore, also considered to be jurisdictional waters of the U.S. The two-year drainage and dredging would be temporary, but may be considered a hydrological interruption, which would be a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

After dredging activities are complete, Funks Reservoir would continue to impound Funks Creek and would become hydrologically connected to the proposed Holthouse Reservoir. Current periodic maintenance required for the existing Funks Reservoir is expected to continue after the Funks Reservoir dredging and its connection to Holthouse Reservoir.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Alkaline Wetlands

Approximately 0.5 acre of alkaline wetlands would be directly impacted by construction of the Holthouse Reservoir Complex. The footprint of the Holthouse to T-C Canal Pipeline would overlap with the northwest end, or headwaters, of one of the shallow alkaline wetland swales that contribute to a 13-acre alkaline wetland. Loss of this portion of the alkaline wetland swale would be a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

A 13-acre alkaline and saline wetland complex lies immediately southeast of the Holthouse Reservoir Complex, located within a 40-acre area that supports an upland (grassland) matrix. This wetland type is rare and sensitive, being potential habitat for several rare plant and invertebrate species (Silveira, pers. comm., 2011). Although it would not be directly impacted by the construction and operation of the Holthouse Reservoir Complex, there is potential during operation for the pressure from the weight of the water behind the dam, and possibly the belowground portion of the dam and discharge pipeline, to affect the underground hydrologic regime supporting this wetland. No groundwater studies have been conducted to evaluate this potential. From inspection of field data on the location of seeps, comparison of current (2009) and historical (1958) aerial photos, and consultation of geology fault-trace maps, it appears that the wetland's water source is likely ancient marine groundwater rising up from the south or southeast. The direction of the bedding dips, and the direction of the faults, would direct underground water up from the south and east. If this is the case, the presence of a dam and reservoir to the west and north would not interfere with the wetland's water source (Gordon et. al, pers. comm., 2011). Because it is not known if the presence and operation of the Holthouse facilities would intercept and cut off the wetland area's underground water supply and dry up the wetland, or might redirect or pressure more water into the area and increase inundation, converting the area into a perennial marsh, these possible effects would be considered a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

In addition to the underground water supply being possibly increased or decreased, overland flow from the uplands along the wetland's western border, particularly to the vernal swale at the wetland area's northwestern corner, would be cut off. This could occur from construction of the Holthouse to T-C Canal Pipeline, which would be located less than 200 feet from the swale and would directly impact the swale's headwater area. The pipeline and dam would be located approximately 300 and 700 feet, respectively, from the hillslope along the wetland's western edge. It is not known to what extent the wetland depends on waters entering from within or from the surface of this upland strip. Thus, this rare and sensitive habitat could be subject to drying or inundation effects from the presence of the proposed Holthouse Reservoir Complex. This indirect hydrological interruption effect would represent a **potentially significant impact** to wetlands, when compared to Existing Conditions and the No Project/No Action Alternative.

Seasonal Wetlands The proposed dredging of the existing Funks Reservoir would involve deepening the bottom and making the sides steeper, which would eliminate the shallow-water areas around its edges. This could result in the desiccation or alteration of the hydrology of the 3.8-acre seasonal wetland area at Funks Reservoir's south end. If this wetland's water supply is not interrupted, it may not be affected; however, the down-cutting of the reservoir edge along the wetland's northern edge may result in desiccation when the lake is not full because its water could abruptly fall into the steeper-sided reservoir basin. The alteration of this wetland could represent a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. No other wetlands have been mapped around the immediate edges of Funks Reservoir. Other seasonal wetlands and a vernal pool in the general area are located more than 500 feet away from the reservoir edge and would be unlikely to be affected by the dredging of Funks Reservoir.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and GCID Canal Connection to the Terminal Regulating Reservoir

The TRR and its associated facilities would be located near the intersection of the existing GCID Canal and the proposed Delevan Pipeline. The waters of the U.S. that could be impacted by these facilities are all agricultural canals. Their acreage and lengths are shown in Table 15-12. No wetlands or ponds would be affected by TRR construction.

Table 15-12
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Terminal Regulating Reservoir, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and the GCID Canal Connection to the TRR

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
Total Wetlands	**0**	
Tributaries 0 to 5 Feet Wide	0.37	0.74
Tributaries 5 to 10 Feet Wide	0.78	0.77
Tributaries 10 to 15 Feet Wide	0.63	0.43
Tributaries > 15 Feet Wide	0.61	0.26
Total Other Waters of the U.S.	**2.39**	**2.19**
Total Ponds	**0**	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

All 2.4 acres (or approximately 2.2 miles) of waters that would be permanently lost to construction of the TRR and its associated facilities consist of agricultural canals. It is likely that these canals would be determined to be non-jurisdictional (USACE, 2011a), and their loss would, therefore constitute **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. No ponds exist at the TRR facility group location; therefore, there would be **no impact** to ponds at that location, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

No wetlands occur within the footprint of these facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

The Delevan Transmission Line analysis for Alternative A includes only the 150-foot-wide construction disturbance area extending between the Sacramento River and the Sites Reservoir Inlet/Outlet Structure to the west of Funks Reservoir[3]. The Delevan Transmission Line construction disturbance area includes all areas needed for transmission line construction activities. This 150-foot-wide corridor would experience mostly temporary disturbance during construction. Once construction is complete, the only Project facility that would generate a permanent impact would be the transmission line tower footings. The total permanent habitat loss associated with the tower footings, with a worst-case scenario of 70 transmission towers with a concrete pad for a base over the entire length of the transmission line, would equal approximately 2.5 acres of agricultural fields and some open grassland, with intermittent streams scattered within the grasslands. Because no additional access or maintenance roads or other infrastructure is proposed, the land between the towers would revert back to its original use. Thus, the impact on much of the acreage within the easement would be temporary for this Project facility. Because there is flexibility in siting the individual tower footings, the likelihood of a tower footing being constructed within or adjacent to any waters of the U.S. is low.

The acres of each type of wetlands and other waters of the U.S. that would be lost or adversely affected within the Delevan Transmission Line easement are summarized in Table 15-13.

Table 15-13
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Delevan Transmission Line East of the Sites Electrical Switchyard

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
Alkaline wetlands	Direct/Permanent: 0.04 Temporary: 2.2	
Vernal pools	Indirect/Temporary: 0.4	
Total Wetlands	Permanent: < 0.1 Temporary: 2.6	
Tributaries 0 to 5 Feet Wide	0.09	0.22
Tributaries 5 to 10 Feet Wide	0.41	0.41
Tributaries10 to 15 Feet Wide	0.44	0.30
Tributaries > 15 Feet Wide	1.77	0.32
Total Other Waters of the U.S.	2.72	1.26
Total Ponds	1.9 acres	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Stream

A total of more than 2.7 acres (or approximately 1.26 miles) of streams could be adversely affected through construction of the tower footings and other construction activities. Because no towers are likely to be placed in or adjacent to waterways, the impact would be temporary. If the water was redirected back into the farmer's irrigation system so that the water would still be available for surrounding fields,

[3] The impacts on wetlands and other waters of the U.S. of the 50-foot-wide easements for the electrical distribution lines that would serve the Recreation Areas are discussed in that analysis.

temporary disruption of these waters by construction of the transmission line would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

East of the GCID Canal, all of these waters (approximately 1.5 acres or 0.8 mile) consist of agricultural canals, mostly between five and 20 feet in width. Where canals are found by the USACE to be non-jurisdictional, as is normally the case (USACE, 2011a), Project effects to canals would constitute **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. West of the GCID Canal, the streams are natural drainages through open grassland or dryland grain fields. In this area, 1.2 acres (0.47 mile) of streams would be at least temporarily impacted by the Delevan Transmission Line construction. Except for where the line would cross Funks Creek, these ephemeral drainages average six feet wide. Because the transmission tower spans can be from 1,200 to 1,300 feet, flexibility in tower footing placement would decrease the likelihood of any tower footing being constructed on or immediately adjacent to any waters of the U.S. Because these drainage features are relatively easily avoided by rerouting the transmission line corridor, their loss or disturbance is unlikely and would be a **less than significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Ponds

A five-acre pond located approximately 3.5 miles west of the Sacramento River could be impacted by the Delevan Transmission Line. This pond is part of an agricultural operation and has no associated natural vegetation. It is likely that tower footings could be constructed to one side of this pond rather than impact it. Because this pond is relatively easily avoided by rerouting the transmission line corridor, its loss or disturbance is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Alkaline Wetlands

Construction of the Delevan Transmission Line could result in direct loss or long-term disturbance of 0.04 acre and temporary disturbance to a maximum of 2.2 acres of disturbed alkaline wetlands in one parcel located approximately three miles west of the Sacramento River. This land is located north of the Delevan NWR, north of the existing road. It is highly disturbed, having been disked in the past, and is currently being managed as a private duck hunting club, with imported tules and other freshwater emergent wetland vegetation. The extent of permanent loss would equal the area of one tower footing (worst case, approximately 1,600 square feet, or 0.04 acre). Because this area is relatively easily avoided by repositioning the towers, this loss would be unlikely, and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Vernal Pools

Although the Delevan Transmission Line construction disturbance area would not be aligned through any vernal pools, it is aligned adjacent to a mapped 0.4-acre vernal pool located west of the GCID Canal. Because the construction disturbance area would be located less than 25 feet south of this vernal pool, the potential exists for direct or indirect impacts to this vernal pool if construction activities are not confined within the defined area. The construction disturbance area would also pass between two small vernal pools in the median strip of I-5, passing approximately 200 feet south of one and 330 feet north of another; each is approximately 0.1 acre in size. Keeping all construction activities within the construction disturbance area would avoid disruption or disturbance to any of these adjacent or nearby pools, so loss or disturbance of the pools would be unlikely, and a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

The pipeline analysis for Alternative A includes the 1,500-foot-wide construction disturbance area that would extend between the Sacramento River and the Holthouse Dam. This includes the portion of the Delevan Pipeline route that would extend from the river to the TRR, the TRR Pipeline route, and the portion of the Delevan Pipeline route that would parallel the TRR Pipeline from the TRR to Holthouse Reservoir and Dam. The latter portion of the pipeline route also includes a permanent gravel maintenance road and electrical switchyard above the pipelines. Once construction is complete, there would be no major pipeline facilities that would generate permanent ground impact; most of the land over the buried pipeline would revert back to its original use. The exceptions would be regularly spaced aboveground facilities, such as blow-off structures, air valve structures, and an outlet and energy dissipater structure. The 20-foot-wide gravel inspection road from the TRR to Holthouse Reservoir and Dam, as well as the electrical switchyard, would generate permanent ground disturbance. The pipeline construction disturbance area would traverse many agricultural canals and some agricultural ponds; some of these might be avoidable. The acres of each type of wetlands and other waters of the U.S. that would be lost or adversely affected within the pipeline, maintenance road, and electrical switchyard construction disturbance area are summarized in Table 15-14.

Table 15-14
Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

Wetland or Other Waters of the U.S. Type	Number of Acres Lost or Disturbed	Number of Miles Lost or Disturbed*
Alkaline wetlands	Indirect: 14.0	
Vernal pools	Indirect: 0.4	
Total Wetlands	**Direct/Permanent: 0** **Indirect: 14.4**	
Tributaries 0 to 5 Feet Wide	0.26	0.46
Tributaries 5 to 10 Feet Wide	8.77	9.16
Tributaries10 to 15 Feet Wide	10.6	6.77
Tributaries > 15 Feet Wide	22.3	7.48
Total Other Waters of the U.S.	**41.9**	**23.9**
Total Ponds	**5.0 acres**	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers,

Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

A total of approximately 42 acres (or approximately 24 miles) of waters could be permanently lost or adversely affected through construction of the buried pipelines and other activities associated with construction of the Delevan and TRR pipelines, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard. All affected waters consist of agricultural canals between three and 30 feet in width. If the water was redirected back into the farmers' irrigation systems so that the water would still be available for surrounding fields, temporary or even permanent disruption of most of these canal waters by the pipelines would not represent a hydrological interruption and would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, because the pipelines' small and regularly spaced above-ground structures (i.e., blow-off structures, air valve structures, and an outlet and energy dissipater structure) could be sited to avoid waters, they would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Ponds

No ponds would be affected by construction of the TRR Pipeline, TRR Pipeline Road, or Delevan Pipeline Electrical Switchyard. The five-acre pond located approximately 3.5 miles west of the Sacramento River would be affected by construction of the Delevan Pipeline (refer to the Delevan Transmission Line discussion for additional description of the pond). The pipeline would pass directly through this pond, resulting in the loss of the entire pond. Because this is an agricultural (human-made) pond, it is possible that it could be restored to its original condition after construction is completed, in which case the effects to this pond would be a **less-than-significant-impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. If the pond's hydrological integrity cannot be restored post construction, then its loss would represent a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. In addition, because the pipelines' small and regularly spaced above-ground structures (i.e., blow-off structures, air valve structures, and an outlet and energy dissipater structure) could be sited to avoid ponds, they would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Construction of the Delevan Pipeline could have a long-term direct adverse impact on two wetland types due to the direct removal of the soil and the replacement of soil over the buried pipeline, and/or by construction access roads, spoils piles, or other mechanical disturbance or displacement within the 1,500-foot-wide construction disturbance area. For wetlands, mechanical disruption of the hydrological regime would result in the permanent destruction of the feature; once disturbed or disrupted, wetland features rarely return to their former ecological integrity.

Alkaline Wetlands

No alkaline wetlands would be affected by construction of the TRR Pipeline, TRR Pipeline Road, or Delevan Pipeline Electrical Switchyard. Construction of the Delevan Pipeline could result in the direct loss or long-term disturbance of a maximum of 14 acres of disturbed alkaline wetlands in one parcel located approximately three miles west of the Sacramento River. This land is located north of the Delevan NWR, north of the existing road along the south end of the Gunnersfield duck club. (Refer to the Delevan Transmission Line discussion for further description of the managed wetland.) Direct disturbance of the duck club managed freshwater wetland would be unavoidable during pipeline construction, which in this case might be temporary. If the managed freshwater wetland could be restored to its full water-containment capacity and use after construction, the pipeline construction would represent a **less-than-significant impact** to these waters, when compared to Existing Conditions and the No Project/No Action Alternative. If it is not possible to restore the impermeable clay bottom of the managed freshwater wetland, then the wetland properties of the parcel would be lost and the pipeline construction would have a **potentially significant impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

The pipeline construction disturbance area is located near a federally protected wetland complex. The Delevan NWR wetlands are separated from the disturbance area by two roads and a canal located along the south edge of the pipeline's construction disturbance area. Because construction activities would occur north of these three barriers, the NWR wetlands would not be adversely affected by sedimentation, mechanical disturbance or other effects of construction activities including traffic, equipment operation, and other aspects of pipeline installation. Because construction would occur north of three effective barriers, there should be **no impacts** to the refuge wetlands, when compared to Existing Conditions and the No Project/No Action Alternative.

Vernal Pools

No vernal pools would be affected by construction of the TRR Pipeline, TRR Pipeline Road, or Delevan Pipeline Electrical Switchyard. The Delevan Pipeline construction disturbance area would pass through three small vernal pools located within the median strip of I-5; each is approximately 0.1 acre in size. The northern two pools are discussed in the Delevan Transmission Line analysis. Although these pools could easily be avoided during transmission line construction, they and the third southernmost pool would be more difficult to avoid during pipeline construction, which would affect a wider swath of land. Because most of the vernal pools formerly present in this part of Colusa County have been converted to agricultural fields, the loss of these few remaining pools would be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative. However, if the pipeline construction occurs completely underground, as proposed, impacts to these pools would be indirect.

The Delevan Pipeline construction disturbance area is located adjacent to a mapped 0.1-acre vernal pool that is located south of the road in the Delevan NWR. Because all construction activities would occur north of the Gunnersfield southern boundary road, there would be **no impact** on this NWR vernal pool, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

The Delevan Pipeline Intake Facilities are associated with the Delevan Pipeline for Alternatives A and C. Construction of these facilities could result in a combination of temporary disruption, long-term disturbance, and permanent loss of existing agricultural canals and natural waters (Sacramento River).

The Sacramento River would be considered traditionally navigable waters (parts are still navigable and have been navigable in the past) or permanent (contains water year-round) waters of the U.S.(USACE, 2011b).The acres of each water type that would be lost as a result of construction of the Delevan Pipeline Intake Facilities are listed in Table 15-15. No ponds exist where the Delevan Pipeline Intake Facilities would be constructed.

Table 15-15
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Delevan Pipeline Intake Facilities

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
Total Wetlands	**0**	**0**
Tributaries 0 to 5 Feet Wide	0.05	0.13
Tributaries 5 to 10 Feet Wide	0	0
Tributaries 10 to 15 Feet Wide	0	0
Tributaries > 15 Feet Wide	0.25	0.10
Sacramento River	1.6	0.12
Total Waters of the U.S.	**1.9**	**0.35**
Total Ponds	**0**	

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

Construction of the Delevan Pipeline Intake Facilities would impact approximately two acres (0.35 mile) of potential waters of the U.S. These acres include agricultural canals, but also include 1.6 acres (0.12 mile) of the Sacramento River. Agricultural canals and ditches are generally not jurisdictional (USACE, 2011a), so canal disturbance from intake facility construction would most likely result in **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

For the Sacramento River, construction activities would create temporary disturbance of this portion of the river, where a cofferdam would extend approximately 40 feet into the river channel. Due to its temporary nature, construction disturbance to this part of the river would represent a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

The completed intake facility would permanently extend into the river channel. However, the existing Maxwell ID Pumping Plant is located in a narrow section of the river and consequently acts as a local flow control point (Reclamation, 2012). Therefore, the portion of the Delevan Pipeline Intake Facilities that would extend into the river would not obstruct the Sacramento River and would have a **less-than-significant impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

During operation, there is potential for ongoing erosional, biotic, and other effects of intake and release. Therefore, the operation of this facility represents a **potentially significant impact** on permanent waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities, including periodic sediment removal from the forebay, would be conducted when the forebay is dewatered and would not be expected to contribute to increased sedimentation of the Sacramento River. Therefore, there would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Riparian Wetlands

No loss of mapped wetlands of any type would result from construction of the Delevan Pipeline Intake Facilities on the Sacramento River. However, small amounts of emergent riparian wetland vegetation in shallow areas along the river's edge could be disturbed or lost to construction activities. The affected area is approximately 0.06 mile long (350 feet) and includes sparse herbaceous growth along the water's edge. This vegetation is variable, influenced by fluctuations in the river; its loss would therefore be temporary and would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

The area within the Project Buffer for Alternative A includes many small streams and a few ponds around the Sites Reservoir footprint, canals around the TRR facilities, and canals and a short river stretch around the Intake facilities. The outer perimeter of the Project Buffer would be fenced.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Ground-disturbing activities that would occur within the Project Buffer outside of existing developed land include fence construction, the creation of a fuelbreak, and the demolition of existing structures. Fence posts could be strategically placed to avoid waters. Their construction would therefore have a **less-than-significant impact** on waters of the U.S. The fuelbreak would consist of permanently disturbed unvegetated land around the perimeter of the Buffer. The exposed soil within the fuelbreak has the potential to contribute sediments to downslope streams. Although any single stream crossing within the fuelbreak would not contribute a significant amount of sediment to waters of the U.S., the total number of stream crossings within the entire Project Buffer could contribute an amount of sediment that could result in a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. Ground disturbance associated with the demolition of existing structures could result in temporary increases in sediment transport to adjacent waters of the U.S. However, this disturbance would be temporary, and lands would be revegetated following demolition. Therefore, structure demolition would have a **less-than-significant impact** on waters of the U.S.

Project and outer perimeter fencing would prevent any ground disturbance and human activity within the Project Buffer during operation. In addition, grazing would also no longer occur within the Project Buffer.

Project operation would, therefore, have **no impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with fence repair would not be expected to affect waters of the U.S., and would, therefore, have a **less-than-significant impact** on waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. Fuelbreak maintenance would result in the removal of any vegetation growth, and therefore, could contribute sediment to downslope streams. The total number of stream crossings that would occur within the entire Project Buffer during maintenance of the fuelbreak could contribute an amount of sediment that could result in a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Demolition of existing structures, as well as activities associated with the construction, operation, and maintenance of fences and a fuelbreak, would have the same impact on wetlands as described for other waters of the U.S.

One probable indirect effect that could occur within the Project Buffer during operation would be conversion of some of the more disturbed shallow seasonal wetlands or vernal pools in the area around the Sites Reservoir footprint to non-native weedy grasslands once cattle-grazing is removed, because this is a common outcome in many wetland or vernal pool landscapes in California (Marty, 2007). The net effect of lack of any direct impacts, but with the indirect effects of cessation of grazing, would most likely be a **less-than-significant impact** to some of the wetlands within the reservoir facilities' Project Buffer.

Summary of Alternative A Impacts to Wetlands and Waters of the U.S.

A summary of the acreages of wetlands and other waters of the U.S. that would be affected by construction, operation, and maintenance of Project facilities as a result of Alternative A implementation are presented in Table 15-16.

Table 15-16
Affected Acres of Wetlands and Other Waters of the U.S. for all Project Facilities: Alternative A

Project Facility	Wetland Type						Waters of the US Type							Notes
	Alkaline	Emergent	Riparian	Seasonal	Vernal Pool	TOTAL WETLAND ACRES	TOTAL PONDS[b] ACRES	Streams 0-5 Feet Wide	Streams 5-10 Feet Wide	Streams 10-15 Feet Wide	Streams <15 Feet Wide	Streams >15 Feet Wide	TOTAL OTHER WATERS OF THE U.S. ACRES	
Sites Reservoir Inundation Area (1.27 MAF) and Dams	19.2	2.4	21.5	153.1	4.3	**200.6**	**26.3** [c]				77	82	**159.0**	Stream acres are same as for 1.81-MAF reservoir because data cannot be separated out
Recreation Areas and Distribution Lines				13.3		**13.3**	**1.3**	2.7	0.2				**3.0**	
Road Relocations and South Bridge	1.1	<0.1		4.2	<0.1	**5.3**	**0.5**	2.1	4.0	1.2		2.2	**9.5**	
Sites Reservoir Inlet/Outlet Structure, Tunnel, Sites Pumping Generating Plant, Field Office Maintenance Yard, and Electrical Switchyard						**0**	**0.2**	0.3	0.6			0.5	**1.4**	
Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard	0.5[a]		2.0			**2.5**			0.3	0.5		5.0	**5.8**	
TRR, GCID Connection to the TRR, TRR Pumping/Generating Plant, and TRR Electrical Switchyard						**0**		0.4	0.8	0.6		0.6	**2.4**	All agricultural canals
Delevan Transmission Line (entire length)	2.2				0.4	**2.6**	**1.9**	0.1	0.4	0.4		1.8	**2.7**	Some natural streams, some canals
Delevan Pipeline (entire length), TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard	14.0				0.4	**14.4**	**5.1**	0.3	8.8	10.6		22.3	**42.0**	All agricultural canals
Delevan Pipeline Intake Facilities						**0**		0.1				1.9	**2.0**	Includes Sacramento River
Project Buffer[d]														Area includes some wetlands and streams
TOTAL ACRES for Primary Study Area (Project Facility Footprints) and Subject to Potential Impacts[e]	**37.0**	**2.4**	**23.5**	**170.6**	**5.1**	**238.7**	**35.3**	**6.0**	**15.1**	**13.3**	**77**	**116.3**	**227.8**	

[a]The northwest 0.5 acre of swale feeding the marsh is within proposed footprint, but hydrologically connected to a 20-acre (estimated minimum area) marsh/swale/vernal pool complex. Wetlands themselves equal 13 acres; entire complex with connecting upland watersheds equal 20 to 40 acres.

[b]Ponds counted separately from streams.

[c]Includes 6.1 acres for Salt Lake. All other pond acreages are stockponds.

[d]Acres of wetlands and other waters of the U.S. types are unknown because the Project Buffer was added after surveys were conducted; consequently, wetland/WUS features were not mapped.

[e]Total acreage does not include acreage associated with the Project Buffer, which has not been surveyed or mapped.

Note:

Primary Study Area is defined as the Project facility footprints except for the Delevan Pipeline, which also includes a wider construction disturbance area, and for Holthouse Reservoir Complex, where alkaline wetlands potentially affected include acres adjacent to dam footprint as well as overlapping with the footprint.

15.3.7 Impacts Associated with Alternative B

15.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to jurisdictional waters of the U.S. (**Impact Wet-1)** and federally protected wetlands (**Impact Wet-2**), would be the same as described for Alternative A for the Extended Study Area.

15.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B operations to jurisdictional waters of the U.S. (**Impact Wet-1)** and federally protected wetlands (**Impact Wet-2**) would be the same as described for Alternative A for Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, *Clear Creek*, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, the American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River, as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

Operational differences for Alternative B, when compared to Alternative A, for the Sacramento River are discussed below.

Sacramento River

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Operational modeling using SacEFT (Appendix 8B) indicates that Project operations would indirectly result in changes in river flows downstream of the diversions for Sites Reservoir. For Alternative B, there would not be any diversion from the Sacramento River at the east end of the Delevan Pipeline (as there would be for Alternatives A and C). Operational modeling indicates that Sacramento River flows associated with implementation of Alternative B would experience changes similar to those described for Alternative A. However, Alternative B would divert up to 3,900 cfs during winter flows (rather than the 5,900 cfs diversion that would occur with Alternative A during winter flows). The reduced rate of diversion would consequently require a longer duration of diversion, lasting from February through May. Despite the increased duration of diversion, minor changes in flows are expected. These minor changes would represent a **less-than-significant impact** on the waters of the Sacramento River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Refer to the **Impact Wet-1** discussion. Due to the minimal fluctuations in flows expected in the Sacramento River with implementation of Alternative B, there would be a **less-than-significant impact** on jurisdictional wetlands present along the edges of the river (most likely in backwater or slough locations), when compared to Existing Conditions and the No Project/No Action Alternative.

15.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to wetlands and other waters of the U.S.:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The footprints of the Recreation Areas for Alternative B are the same as Alternative A, but the electrical distribution lines that would serve the Alternative B Saddle Dam Recreation Area would have a different alignment than was evaluated for Alternative A. However, the two Alternatives' distribution lines would cross equivalent extents of very small tributary drainages, distributed the same over the various stream widths, and would, therefore, have the same impacts on jurisdictional waters of the U.S. (**Impact Wet-1**) and federally protected wetlands (**Impact Wet-2**), as described for Alternative A.

Despite the larger reservoir size and increased number of dams with implementation of Alternative B, the impacts of Sites Reservoir and Dams to jurisdictional waters of the U.S. (**Impact Wet-1**) would be the same for Alternative B as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on jurisdictional waters of the U.S. (**Impact Wet-1**) and federally protected wetlands (**Impact Wet-2**), as described for Alternative A.

The remaining facilities, and their impacts associated with implementation of Alternative B, are described below.

Sites Reservoir Inundation Area and Dams

Ground disturbance associated with dam construction and borrow areas, as well as inundation by a 1.81-MAF Sites Reservoir, would have a long-term direct adverse impact on existing wetlands and other waters of the U.S. due to direct removal of wetlands or waters and replacement by standing water, sterile subsoil, or permanent facilities. Construction of the associated dams would result in the complete loss of existing waters and wetlands within their footprints. Alternative B includes nine saddle dams as well as Golden Gate Dam and Sites Dam. The acres of each wetland or waters type that would be affected by the 1.81-MAF Sites Reservoir and its associated dams are listed in Table 15-17. Ponds are considered separately from wetlands or tributary streams.

Table 15-17
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the 1.81-MAF Sites Reservoir Inundation Area and Dams

Wetland or Other Waters of the U.S. Type	Number of Acres Affected	Number of Miles Affected*
Alkaline	19.2	
Emergent	2.4	
Riparian	23.0	
Seasonal	164.9	
Vernal pool	4.7	
Total Wetlands	**214.2**	
Tributaries 0 to 15 Feet Wide (smaller tributaries)	77	123
Tributaries > 15 Feet Wide (major tributaries)	82	25
Total Other Waters of the U.S.	**159**	**148**
Total Ponds	**20.7**	
Salt Lake	6.1	

*Only streams are indicated.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Seasonal Wetlands

Approximately 164 acres (11 acres more than for Alternative A) of seasonal wetlands would be permanently lost through initial inundation and repeated water level fluctuations within Sites Reservoir. These 113 wetlands (16 more than for Alternative A) are mostly small areas associated with low-lying swales, valley bottoms, or shallow drainages especially in clay-dominated soils. More than half are smaller than one acre in size; 30 are between one and five acres, and 10 (two more than for Alternative A) are larger than five acres. The impacts to seasonal wetlands associated with Salt Lake are the same as described for Alternative A. The loss of all of these seasonal wetlands (especially because they include some partly alkaline or saline features) would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Vernal Pools

The construction and inundation of Sites Reservoir and Dams would result in the direct and permanent loss of approximately 4.7 acres of vernal pools (0.7 acre more than for Alternative A), many of which are either artificially created impoundments or highly disturbed/degraded by long-term heavy grazing. These 17 vernal pools (one more than for Alternative A) are distributed throughout the reservoir footprint in Antelope Valley. The largest (larger than 1.3 acres) is associated with Salt Lake. The remaining features are all smaller than one acre in size. Because the vernal pools of the western edge of the Sacramento Valley are already much reduced in number, the loss of these vernal pools (especially because they include some partly alkaline or saline features) would be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Emergent Wetlands

The impact of Alternative B on emergent wetlands would be the same as described for Alternative A.

Riparian Wetlands

More than 23 acres of riparian wetlands were mapped and identified within the reservoir footprint for Alternative B. Most of these 16 mapped areas are one acre or smaller in size, and consist of sparse wetland vegetation within disturbed intermittent stream channels. The loss of these riparian wetlands would be considered a **potentially significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

The road relocation construction disturbance area would differ slightly to serve different sets of dams, but the two Alternatives' routes would cross equivalent extents of very small tributary drainages. They both would impact approximately 12 miles (or 9.5 acres) of waters of the U.S., distributed the same over the various stream widths. However, Alternative B would result in a slightly greater impact, affecting 0.3 mile (0.1 acre) more waters than Alternative A. This increase is due largely to some substantial crossings of creeks associated with salt springs in the area south of the Saddle Dam Recreation Area; only Alternative B's road route traverses this sensitive area of wetlands and waters on its way to Saddle Dams 1 and 2. For Alternative B, the combined length of almost 12 miles and the connection of several streams with wetland features near the Saddle Dam Recreation Area would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Ponds

The impact of roads on ponds for Alternative B would be the same as described for Alternative A.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

Seasonal Wetlands

For Alternative B, the impacts of the road relocations on wetlands would be similar to Alternative A, exceeding Alternative A only by 0.17 acre more of impacts to seasonal wetlands along the road south of the Saddle Dam Recreation Area, for a total of 5.6 acres of seasonal wetlands lost to construction activities. As described for Alternative A, although seasonal wetlands can be considered jurisdictional features, these small wetlands can be easily avoided by relocation of the route, so their loss is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

If Alternative B is implemented, the affected wetlands and waters acreage from construction of the Delevan Transmission Line would be less than half of the total for Alternative A because there would be no transmission line alignment from the Sacramento River to the PG&E transmission line. Only the portion of the transmission line that would connect the Sites Pumping/Generating Plant to the PG&E or WAPA transmission line would be constructed (a total of up to three miles, compared to more than 12 miles for Alternative A) (Figure 3-1 in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives). Construction of this part of the transmission line would impact small tributary streams, but no wetlands or ponds.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

West of the GCID Canal, 1.2 acres (0.47 mile) of streams through open grassland or dryland grain fields would be at least temporarily impacted by the Delevan Transmission Line construction. Except for where the line would cross Funks Creek, these ephemeral drainages average six feet wide. Because the transmission tower spans could be from 1,200 to 1,300 feet, flexibility in tower footing placement would decrease the likelihood of any tower footing being constructed on or immediately adjacent to any waters of the U.S. Because these drainage features are relatively easily avoided by rerouting the transmission line corridor, their loss or disturbance is unlikely and would be a **less-than-significant impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

No wetlands occur within the construction disturbance area of the Alternative B Delevan Transmission Line. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Discharge Facility

The Delevan Pipeline Discharge Facility is associated with the Delevan Pipeline for Alternative B. Construction of this facility could result in a combination of temporary disruption, long-term disturbance, and permanent loss of existing agricultural canals and natural waters (Sacramento River). The Sacramento River would be considered traditionally navigable waters (parts are still navigable and have been navigable in the past) or at least permanent (contains water year-round) waters of the U.S. (USACE, 2011b). Construction of the Discharge Facility would impact fewer acres of tributaries (agricultural canals) and a smaller area of the Sacramento River than construction of the Delevan Pipeline Intake Facilities described for Alternative A. No ponds exist where the Delevan Pipeline Discharge Facilities would be constructed. The acres of each wetland or water type that would be lost from the construction of the Delevan Pipeline Discharge Facility are listed in Table 15-18.

Table 15-18
Direct Loss of Wetlands and Other Waters of the U.S. Due to the Construction of the Delevan Pipeline Discharge Facility

Wetland or Other Waters of the U.S. Type	Number of Acres Lost	Number of Miles Lost*
TOTAL Wetlands	**0**	**0**
Tributaries 0 to 5 Feet Wide	0	0
Tributaries 5 to 10 Feet Wide	0	0
Tributaries 10 to 15 Feet Wide	0	0
Tributaries > 15 Feet Wide	0.05	0.02
Sacramento River	0.09	0.03
Total Other Waters of the U.S.	**0.14**	**0.05**
Total Ponds	**0**	**0**

*Only streams are indicated.

Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means

Streams

Construction of the Discharge Facility would directly impact approximately 0.14 acre (0.05 mile) of potential waters of the U.S. These acres consist of an agricultural canal, but also include 0.09 acre (0.03 mile) of the Sacramento River. Agricultural canals and ditches are generally not jurisdictional (USACE, 2011a), so disturbance to this canal would most likely represent **no impact** to waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative. For the Sacramento River, construction activities would create temporary disturbance in a small portion of the river where the cofferdam would extend approximately 5 to 10 feet out into the channel. Due to its temporary nature, discharge facility construction disturbance to this part of the river would represent a **less-than-significant impact** to waters of the U.S. However, due to the potential for ongoing erosional, biotic, and other effects of release as a result of Project operation, the operation of this facility represents a **potentially significant impact** on permanent waters of the U.S., when compared to Existing Conditions and the No Project/No Action Alternative

Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means

No loss of mapped wetlands of any type would result from construction of the Delevan Pipeline Discharge Facility on the Sacramento River. Very small amounts of emergent riparian wetland vegetation along the river's edge could be disturbed or lost to construction activities. The affected area is approximately 0.02 mile long (140 feet) and includes intermittent sparse herbaceous growth at the base of a steep slope below riparian forest. This vegetation is variable, influenced by fluctuations in the river; its loss would therefore be temporary and would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Summary of Alternative B Impacts to Wetlands and Other Waters of the U.S.

A summary of the acreages of wetlands and other waters of the U.S. that would be affected by construction, operation, and maintenance of Project facilities as a result of implementing Alternative B are presented in Table 15-19.

Table 15-19
Affected Acres of Wetlands and Other Waters of the U.S. for all Project Facilities: Alternative B

Project Facility	Wetland Type							Other Waters of the US Type						Notes
	Alkaline	Emergent	Riparian	Seasonal	Vernal Pool	TOTAL WETLAND ACRES	TOTAL POND ACRES[b]	Streams 0-5 Feet Wide	Streams 5-10 Feet Wide	Streams 10-15 Feet Wide	Streams <15 Feet Wide	Streams >15 Feet Wide	TOTAL OTHER WATERS OF THE U.S. ACRES	
Sites Reservoir Inundation Area (1.81 MAF) and Dams	19.2	2.4	23.0	164.9	4.7	**214.2**	26.8[c]				77	82	**159.0**	
Recreation Areas and Distribution Lines				13.3		**13.3**	1.3	2.7	0.2				**3.0**	
Road Relocations and South Bridge	1.1	<0.1		4.2	<0.1	**5.3**	0.5	2.1	4.0	1.2		2.2	**9.5**	
Sites Reservoir Inlet/Outlet Structure, Tunnel, Sites Pumping Generating Plant, Field Office Maintenance Yard, and Electrical Switchyard						**0**	0.2	0.3	0.6			0.5	**1.4**	
Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard	0.5[a]		2.0			**2.5**			0.3	0.5		5.0	**5.8**	
TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, and TRR Electrical Switchyard						**0**		0.4	0.8	0.6		0.6	**2.4**	All agricultural canals
Delevan Transmission Line (entire length)	2.2				0.7	**2.9**	1.9	0.1	0.4	0.4		1.8	**2.7**	Some natural streams, some canals
Delevan Pipeline (entire length), TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard	14.0				0.4	**14.4**	5.1	0.3	8.8	10.6		22.3	**42.0**	All agricultural canals
Delevan Pipeline Discharge Facility						**0**		0.1				1.9	**2.0**	Includes Sacramento River
Project Buffer[d]														Area includes some wetlands and streams
TOTAL ACRES for Primary Study Area (Project Facility Footprints) and Subject to Potential Impacts[e]	**37.0**	**2.4**	**25**	**182.4**	**5.8**	**252.6**	**35.8**	**6.0**	**15.1**	**13.3**	**77**	**116.3**	**227.8**	

[a]The northwest 0.5 acre of swale feeding marsh is within proposed footprint, but hydrologically connected to a 20-acre (estimated minimum area) marsh/swale/vernal pool complex. Wetlands themselves equal 13 acres; entire complex with connecting upland watersheds equal 20 to 40 acres.

[b]Ponds counted separately from streams.

[c]Includes 6.1 acres for Salt Lake. All other pond acreages are stockponds.

[d]Acres of wetlands and other waters of the U.S. types are unknown because the Project Buffer was added after surveys were conducted; consequently, wetland/WUS features were not mapped.

[e]Total acreage does not include acreage associated with the Project Buffer, which has not been surveyed or mapped.

Note:

Primary Study Area is defined as the Project facility footprints except for the Delevan Pipeline, which also includes a wider construction disturbance area corridor, and for Holthouse Reservoir complex, where Alkaline wetlands potentially affected include acres adjacent to dam footprint as well as overlapping with the footprint.

15.3.8 Impacts Associated with Alternative C

15.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to jurisdictional waters of the U.S. (**Impact Wet-1)** and federally protected wetlands (**Impact Wet-2**), would be the same as described for Alternative A for the Extended Study Area.

15.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C operations, as they relate to jurisdictional waters of the U.S. (**Impact Wet-1)** and federally protected wetlands (**Impact Wet-2**), would be the same as described for Alternative A for Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, *Clear Creek*, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, the American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and for the Sacramento River as it pertains to the construction, operation, and maintenance impacts associated with the pump installation at the Red Bluff Pumping Plant.

Because Alternative C includes the three Project intake locations that were described for Alternative A, the impacts associated with Alternative, as they relate to the jurisdictional waters of the U.S. (**Impact Wet-1)** and federally protected wetlands (**Impact Wet-2**) of the Sacramento River, would be the same as described for Alternative A.

15.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to wetlands and other waters of the U.S.:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road

- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to wetlands and other waters of the U.S. as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Facilities and Associated Distribution Lines, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to wetlands and other waters of the U.S. as described for Alternative B.

The boundary of the Project Buffer would be the same for all three alternatives, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on jurisdictional waters of the U.S. (**Impact Wet-1**) and federally protected wetlands (**Impact Wet-2**), as described for Alternative A.

Summary of Alternative C Impacts to Wetlands and Other Waters of the U.S.

A summary of the acreages of wetlands and other waters of the U.S. that would be affected by construction, operation, and maintenance of Project facilities as a result of implementing Alternative C are presented in Table 15-20.

Table 15-20
Affected Acres of Wetlands and Other Waters of the U.S. for all Project Facilities: Alternative C

	Wetland Type						Waters of the US Type							
Project Facility	**Alkaline**	**Emergent**	**Riparian**	**Seasonal**	**Vernal Pool**	**TOTAL WETLAND ACRES**	**TOTAL POND ACRES[b]**	**Streams 0-5 Feet Wide**	**Streams 5-10 Feet Wide**	**Streams 10-15 Feet Wide**	**Streams <15 Feet Wide**	**Streams >15 Feet Wide**	**TOTAL OTHER WATERS OF THE U.S. ACRES**	**Notes**
Sites Reservoir Inundation Area (1.81 MAF) and Dams	19.2	2.4	23.0	164.9	4.7	**214.2**	26.8[c]				77	82	**159.0**	
Recreation Areas and Distribution Lines				13.3		**13.3**	1.3	2.7	0.2				**3.0**	
Road Relocations and South Bridge	1.1	<0.1		4.2	<0.1	**5.3**	0.5	2.1	4.0	1.2		2.2	**9.5**	
Sites Reservoir Inlet/Outlet Structure, Tunnel, Sites Pumping Generating Plant, Field Office Maintenance Yard, and Electrical Switchyard						**0**	0.2	0.3	0.6			0.5	**1.4**	
Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard	0.5[a]		2.0			**2.5**			0.3	0.5		5.0	**5.8**	
TRR, GCID Connection to the TRR, TRR Pumping/Generating Plant, and TRR Electrical Switchyard						**0**		0.4	0.8	0.6		0.6	**2.4**	All agricultural canals
Delevan Transmission Line (entire length)	2.2				0.4	**2.6**	1.9	0.1	0.4	0.4		1.8	**2.7**	Some natural streams, some canals
Delevan Pipeline (entire length), TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard	14.0				0.4	**14.4**	5.1	0.3	8.8	10.6		22.3	**42.0**	All agricultural canals
Delevan Pipeline Intake Facilities						**0**		0.1				1.9	**2.0**	Includes Sacramento River
Project Buffer[d]														Area includes some wetlands and streams
TOTAL ACRES for Primary Study Area (Project Facility Footprints) and Subject to Potential Impacts[e]	**37.0**	**2.4**	**25**	**182.4**	**5.5**	**252.3**	**35.8**	**6.0**	**15.1**	**13.3**	**77**	**116.3**	**227.8**	

[a]The northwest 0.5 acre of swale feeding marsh is within proposed footprint, but hydrologically connected to a 20-acre (estimated minimum area) marsh/swale/vernal pool complex. Wetlands themselves equal 13 acres; entire complex with connecting upland watersheds equal 20 to 40 acres.

[b]Ponds counted separately from streams.

[c]Includes 6.1 acres for Salt Lake. All other pond acreages are stockponds.

[d]Acres of wetlands and other waters of the U.S. types are unknown because the Project Buffer was added after surveys were conducted; consequently, wetland/WUS features were not mapped.

[e]Total acreage does not include acreage associated with the Project Buffer, which has not been surveyed or mapped.

Note:

Primary Study Area is defined as the Project facility footprints except for the Delevan Pipeline, which also includes a wider construction disturbance area corridor, and for Holthouse Reservoir complex, where Alkaline wetlands potentially affected include acres adjacent to dam footprint as well as overlapping with the footprint.

PRELIMINARY – SUBJECT TO CHANGE

15.4 Mitigation Measures

It should be noted that some of the wetlands identified as being adversely affected by the construction of various Project facilities have been identified as jurisdictional wetland types in a preliminary wetland delineation study. Other Project facilities have not been field-delineated, and the preliminary wetland delineation still needs to be verified by the USACE. In addition, some irrigation canals and drainage ditches mapped within Project facility footprints could be considered jurisdictional.

All jurisdictional determinations shall be made as part of a formal wetland delineation process; DWR and Reclamation shall provide information to support a CWA 404(b)(1) analysis. Final determination of jurisdictional status and associated Project impacts to such jurisdictional wetlands would be decided by USACE. If as a result of a wetland delineation and jurisdictional determination, the USACE determines that the Project would impact jurisdictional waters and wetlands, avoidance, minimization, and mitigation measures shall be implemented pursuant to USACE guidance to ensure that the Project would result in no-net-loss of waters of the U.S. and that impacts would be reduced to less-than-significant levels. Impact avoidance shall be achieved by placing all structures, heavy equipment, spoils piles, staging areas, and construction access roads at least 200 feet away from the wetland or water feature where feasible. Impact minimization shall be achieved through use of BMPs, a Stormwater Pollution Prevention Plan, protective fencing, erosion control, and/or protective berms or wattles during construction, operation, and maintenance of Project facilities. Compensatory mitigation may consist of:

- Obtaining credits from a mitigation bank;
- Making a payment to an in-lieu fee program that would conduct wetland, stream, or other aquatic resource restoration, creation, enhancement, or preservation activities; or
- Aquatic resource restoration, establishment, enhancement, and/or preservation activities within the same watershed as the Project impacts (off-site mitigation) where on-site mitigation would not be possible.

Mitigation measures are provided below and summarized in Table 15-21 for the impacts that have been identified as significant or potentially significant.

Mitigation Measure Wet-1a: Implement Compensatory Mitigation Measures for Streams pursuant to USACE Determination within the Watershed in which the Impacts Occur

Compensatory mitigation for streams shall be provided for each significant impact identified by the USACE determination according to ratios determined by the USACE for the appropriate category and degree of severity of loss or impact. Mitigation shall occur within the watershed in which the impacts occur:

- Sites Reservoir & Dams, Recreation Areas - Funks/Hunter/Antelope/Grapevine/Stone Corral Creek watersheds.
- Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility – Sacramento River adjacent to facility location.
- Road Relocations, Funks Reservoir, Holthouse Reservoir Complex, Sites Inlet/Outlet Structure and associated facilities, Field Office Maintenance Yard, Electrical Switchyard –Funks Creek watershed.

Table 15-21
Summary of Mitigation Measures for
NODOS Project Impacts to Wetlands and Other Waters of the U.S.

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Wet-1: A Permanent Change in the Use, Quality (Extent in Acres or Miles) of "Other Waters of the U.S.", (Including, but not Limited to, Lakes, Rivers, Streams Tributary to Navigable Rivers, Natural Ponds, Canals, or Ditches) that are Determined by the USACE to be Jurisdictional, through Direct Removal, Filling, Obstruction, Hydrological Interruption, or other Means				
Impact Wet-2a: Seasonal Wetlands	Sites Reservoir & Dams, Recreation Areas, Funks Reservoir	Potentially Significant	Mitigation Measure Wet-2a: Conserve, enhance, restore, or create seasonal wetlands, or implement other compensatory mitigation measures per USACE determination within the watershed in which the impacts occur.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Impact Wet-1a: Streams	Sites Reservoir & Dams, Recreation Areas, Road Relocations, Sites Inlet/Outlet Structure, Field Office Maintenance Yard, Funks Reservoir, Holthouse Reservoir Complex, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility	Potentially Significant	Mitigation Measure Wet-1a: Implement compensatory mitigation measures for streams per USACE determination within the watershed in which the impacts occur.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Impact Wet-1b: Canals	Subject to USACE determination	Potentially Significant	Mitigation Measure Wet-1b: Reroute canals to ensure continued hydrological connection, or implement other compensatory mitigation measures per USACE determination.	Less than Significant
Impact Wet-1c: Ponds	Funks Reservoir, Delevan Pipeline	Potentially Significant	Mitigation Measure Wet-1c: Restore pond to original condition, or implement other compensatory mitigation measures per USACE determination within the same hydrologic unit in which the pond occurs.	Less than Significant

Table 15-21
Summary of Mitigation Measures for
NODOS Project Impacts to Wetlands and Other Waters of the U.S.

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Wet-2: A Permanent Adverse Effect to Federally Protected Wetlands (as Defined by Section 404 of the Clean Water Act [Including, but not Limited to, Marsh, Vernal Pool, Coastal]) through Direct Removal, Filling, Hydrological Interruption, Discharge of Pollutants, or Other Means				
Impact Wet-2b: Alkaline Wetlands	Sites Reservoir & Dams, Holthouse Reservoir Complex, Delevan Pipeline	Potentially Significant	Mitigation Wet-2b: Conserve, enhance, restore, or create alkaline wetlands, or implement other compensatory mitigation measures per USACE determination within the watershed in which the impacts occur.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Impact Wet-2c: Vernal Pools	Sites Reservoir & Dams, Delevan Pipeline	Potentially Significant	Mitigation Measure Wet-2c: Conserve, enhance, restore, or create vernal pools equivalent to the type of vernal pools adversely impacted, or implement other compensatory mitigation measures per USACE determination.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Impact Wet-2d: Emergent Wetlands	Sites Reservoir & Dams	Potentially Significant	Mitigation Measure Wet-2d: Conserve, enhance, restore, or create emergent wetlands, or implement other compensatory mitigation measures per USACE determination within the watershed in which the impacts occur.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant
Impact Wet-2e: Riparian Wetlands	Sites Reservoir & Dams	Potentially Significant	Mitigation Measure Wet-2e: Conserve, enhance, restore, or create comparable riparian wetlands in the inner coast range foothills, or implement other compensatory mitigation measures per USACE determination.	Less than Significant
	Project Buffer	Potentially Significant	Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure SW Qual-1c(1): Implement Soil Stabilization and Sediment Control BMPs

During Project construction activities, on-site monitoring shall be performed to identify runoff impacts. Appropriate soil stabilization BMPs; such as hydroseeding and application of other soil binders; installation of culverts, pipelines, and lined ditches to divert stormwater around disturbed soil areas; dust suppression through application of water to unpaved access roads; and placing cover material over material stockpiles; shall be implemented to reduce potentially significant construction impacts from erosion to a less-than-significant level. Sediment control BMPs, such as installation of fiber rolls and straw bales, settling/desilting basins, and other control measures, shall be implemented to reduce potentially significant construction impacts to wetlands and waters of the U.S. through sedimentation to a less-than-significant level. Details of these BMPs are described in Section WM-3 of the *Construction Site Best Management Practices Manual* (Caltrans, 2003).

Mitigation Measure Wet-1b: Reroute Canals to Ensure Continued Hydrological Connection, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination

For impacts to canals, mitigation shall include re-routing the canals to ensure continued hydrological connection to traditional waters of the U.S. Loss of emergent wetland habitat from within canals shall be mitigated for in other ways, as recommended by the USACE.

Mitigation Measure Wet-1c: Restore Ponds to Original Condition, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Same Hydrologic Unit in which the Ponds Occur

The pond located 3.5 miles west of the Sacramento River within the Delevan Pipeline construction disturbance area should be restored after construction is completed to its current condition as an agricultural pond. If restoration is not possible, compensatory mitigation measures, pursuant to USACE determination, shall be implemented within the Hunters Creek-Logan Creek watershed downstream of their confluence.

Mitigation Measure Wet-2a: Conserve, Enhance, Restore, or Create Seasonal Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur

For the seasonal wetlands located along the edge of Funks Reservoir, alter the extent of dredging so that the slope of the reservoir bottom is more tapered at this point.

Mitigation Measure Wet-2b: Conserve, Enhance, Restore, or Create Alkaline Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur

The local saline spring areas further upslope in same geological formation as the springs that feed Salt Lake shall be enhanced. These springs are located outside of the Sites Reservoir footprint but in the creases of the foothills due north of Salt Lake. Some of them may be able to be expanded, and could possibly be partially protected from grazing impacts with the installation of protective fencing.

A conservation agreement shall be entered into with Reclamation to manage and protect the entire alkaline wetland area southeast of Holthouse Reservoir. Management shall include burning and grazing regimes similar to those used effectively on the Sacramento NWR.

A purchase or conservation agreement shall be entered into with the utilities or other landowners to protect and manage other saline/alkaline wetland habitats in parcels east of the T-C Canal, north of the Primary Study Area. Protected areas might include a potential alkaline wetland area southeast of the Colusa Generating Station located along the T-C Canal.

For the Holthouse Reservoir alkaline wetlands, a hydrogeologic study shall be conducted to determine the direction and sources of water supplying the seeps, swales, and main wetland area, to better inform evaluation of potential effects of placing the dam and reservoir in proximity of the wetland's west edge. The study shall include testing of the wetland area's water and soils, and may allow for development of minimization measures.

Mitigation Measure Wet-2c: Conserve, Enhance, Restore, or Create Vernal Pools Equivalent to the Type of Vernal Pools Adversely Impacted, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination

For vernal pools, the type of vernal pools conserved elsewhere shall be equivalent to the type lost from the Primary Study Area – most likely, claypan and alkaline vernal pools. Consultation with vernal pool experts shall occur to ensure ecological equivalence.

Mitigation Measure Wet-2d: Conserve, Enhance, Restore, or Create Emergent Wetlands, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination within the Watershed in which the Impacts Occur

[Text to be developed]

Mitigation Measure Wet-2e: Conserve, Enhance, Restore, or Create Comparable Riparian Wetlands in the Inner Coast Range Foothills, or Implement other Compensatory Mitigation Measures pursuant to USACE Determination

For the two-acre riparian wetland and waters of Funks Creek lost to Holthouse Reservoir, a comparable area in the inner coast range foothills shall be selected for restoration and conservation.

Implementation of **Mitigation Measures Wet-1a, Wet-1b, Wet-1c, Wet-2a, Wet-2b, Wet-2c, Wet-2d, Wet-2e**, and **SW Qual-1c(1),** would reduce Project impacts to wetlands and other waters of the U.S. to **less than significant**.

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16. Geology, Minerals, Soils, and Paleontology

16.1 Introduction

This chapter describes the geologic, minerals, soils, and paleontologic setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for geology, minerals, soils, and paleontological resources are discussed briefly in this chapter, and are presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate. Because none were identified for minerals, no mitigation is included in this chapter for that resource.

16.2 Environmental Setting/Affected Environment

16.2.1 Extended Study Area

16.2.1.1 Geology

Of the 48 contiguous states, California contains the highest and the lowest elevations only 80 miles apart, plus a variety of rocks, structures, and mineral resources equaled by few areas in the world (Norris and Webb, 1990).

California's landscapes are extremely varied, ranging from the broad nearly flat floor of the Great Valley to the jagged glaciated Sierra Nevada. Eleven geomorphic provinces[1] are recognized (Figure 16-1): the Sierra Nevada, the Klamath Mountains, the Cascade Range, the Modoc Plateau, the Basin and Range, the Mojave Desert, the Colorado Desert, the Peninsular Ranges, the Transverse Ranges, the Coast Ranges, and the Great Valley.

California's geologic diversity, in part, is attributed to its location astride two major tectonic plates: the North American Plate and the Pacific Plate. The active San Andreas Fault, heading north out of the Gulf of California, westward along the Transverse Ranges, then northwestward within and west of the Coast Ranges up to Cape Mendocino, separates the North American Plate from the Pacific Plate. Active faulting is an important feature of California's structural pattern. The San Andreas Fault has been crucial in California's geologic history since at least the Miocene epoch (approximately 23 million years ago [MYA]). The ground surface at the fault has moved as much as 350 miles. Other important faults are the Calaveras and Hayward in the San Francisco Bay area, the Nacimiento in the southern Coast Ranges, the San Jacinto of the Peninsular Ranges, the Sierra Nevada in eastern California, and the Garlock, which separates the Mojave Desert from the Sierra Nevada and the Basin and Range.

[1] The geomorphic provinces are topographic-geologic groupings based primarily on landforms and late Cenozoic structural and erosional history.

The oldest rocks found in California are metamorphic rocks as much as 1.8 billion years old, which occur in the San Gabriel and San Bernardino mountains and in the Mojave and Basin and Range provinces. During the Paleozoic era (approximately 600 MYA), most of California was below sea level and thick sequences of marine sediments were deposited. These sediments ranged from near-shore limestone in the east to deeper-water deposits composed of volcanic detritus[2] from offshore islands mixed with oceanic crustal materials. Marine conditions continued into the Mesozoic era (beginning approximately 260 MYA) but with active subduction[3] as the Pacific Plate plunged under the North American Plate. The sea withdrew to the west and mountains developed in eastern California accompanied by some granitic intrusive activity. With some pauses or interruptions, subduction continued through the latter part of the Mesozoic era when granitic intrusions were again voluminous and very widespread.

Granitic rocks from the Mesozoic era are by far the most abundant igneous rocks in California and are exposed in most provinces. Sedimentation continued offshore in deep marine basins from material stripped off the rising mountains to the east and from volcanic material derived from a chain of offshore volcanic islands; these sediments later become known as the Franciscan Complex. Marine sedimentation decreased in the Cenozoic era (beginning approximately 70 MYA), confined primarily in and west of the San Joaquin Valley and in scattered locations in Southern California. Subduction slowed considerably later in the Cenozoic era, but compressive forces continued, raising the Coast Ranges and eventually closing off the Central Valley from the Pacific Ocean. Beginning in the Eocene epoch and continuing to the Pleistocene, the Central Valley inland basin gradually filled in with continental deposits. During the Pleistocene epoch[4] (approximately 2.6 MYA), extensive glaciation sculpted the Sierra Nevada and other mountain ranges, and large inland lakes developed west of the Sierra Nevada.

16.2.1.2 Minerals

California's geology has resulted in a wealth of mineral resources, including industrial, metallic, and nonmetallic minerals. These minerals are important to the state's economy. California ranks second in the U.S. in non-fuel mineral production; in 2005, over 30 non-fuel mineral commodities – valued at $3.7 billion – were produced from 820 California mines (CGS, No Date).California's major mineral resources include sand, gravel, crushed stone, building stone, gold, silver, iron, evaporite[5] minerals, and clay.

Sand and gravel are California's most valuable industrial minerals. Most sand and gravel is mined from alluvial deposits, which include sediment from streams and alluvial fans. Other important industrial minerals are crushed stone and limestone.

Gold, silver, and iron are the major metallic minerals mined in California. The most productive gold mining areas include the Sierra Nevada, the Klamath Mountains, and the Mojave Desert. Silver is mined in the Sierra Nevada and iron is mined in the Mojave Desert region. Copper and zinc were mined extensively in the past century, particularly in the Klamath Mountains and the Sierran foothills; production has decreased substantially in recent decades.

Other economically important nonmetallic minerals include borates, which are mined in southern California, and gypsum and clay minerals.

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[2] Volcanic detritus is loose fragments, such as sand or gravel, which has been worn away from rock.

[3] Subduction is a geologic process in which one edge of one crustal plate is forced below the edge of another.

[4] An epoch is the shortest division of geologic time.

[5] Evaporite is a nonclastic sedimentary rock composed primarily of minerals produced from a saline solution as a result of extensive or total evaporation of the solvent. Examples include gypsum, anhydrite, rock salt, primary dolomite, and various nitrates and borates.

Oil has been found in 18 counties in California, primarily in the San Joaquin Valley and Southern California. Small amounts of oil are also produced in the northern California near Eureka. Natural gas is generally formed with oil; however, natural gas is produced in the Sacramento Valley without any recoverable oil resources.

Ultramafic[6] rocks, possibly containing localized veins of asbestos, occur widely throughout California (CGS, 2000a).

16.2.1.3 Soils

California has over 700 distinct soil series map units.[7] California soil types vary extensively. In the mountains of northern California, where precipitation is higher and vegetation abundant, soil depths are generally deeper with a greater abundance of clay. At lower elevations, such as the Sacramento Valley, rich alluvial soils predominate, supporting an extensive agricultural region. Soils within the southern California coastal plains and adjacent mountains are more clastic (i.e., clay-poor) due to lower precipitation and less vegetation. Soil development east of the Sierra Nevada and the desert portions of Southern California is less extensive.

16.2.1.4 Paleontology

Table 16-1 shows the fossil locations and number of fossils found in a database search of the Extended Study Area. Fossils found in the Extended Study Area range from microfossils (fossils of single-celled organisms) to large megafossils (fossils of larger organisms, ranging from small invertebrates to large mammals). Several counties contain more fossil localities than there are actual fossils on record. Typically, these localities represent sites where fossils have been discovered, but the specimens have yet to be added to the database. Because no impacts to paleontological resources are anticipated in the Extended Study Area, a full paleontological inventory review of the Extended Study Area was not conducted.

Table 16-1
Fossils and Fossil Locations within the Extended Study Area

County	UCMP Database		PaleoBiology Database	
	Fossils	Localities	Species	Localities
Alameda	1520	401	63	12
Butte	136	130	100	23
Calaveras	27	31	2	2
Colusa	67	138	25	4
Contra Costa	10,712	2,446	0	0
El Dorado	360	22	0	0
Fresno	2,819	1,890	405	65
Glenn	21	73	28	5
Imperial	179	68	171	12

[6] Ultramafic rocks are igneous rocks that form in high temperature environments well below the surface of the earth. By the time they are exposed at the surface by uplift and erosion, ultramafic rocks may be partially to completely altered to serpentinite, a type of metamorphic rock in which small amounts of chrysotile asbestos are common.

[7] The soil series is the lowest category of the national soil classification system. The name of a soil series or the phase of a soil series is the most common reference term used in soil map unit names. The name of a soil series is also the most common reference term used as a soil map unit component. The purpose of the soil series category is closely allied to the interpretive uses of the system, though map unit components provide the interpretive applications within soil survey for most detailed purposes. Soil series are the most homogeneous classes in the system of taxonomy (NRCS, 2011).

Table 16-1
Fossils and Fossil Locations within the Extended Study Area

County	UCMP Database		PaleoBiology Database	
	Fossils	Localities	Species	Localities
Kern	9,171	1,620	1,183	151
Kings	823	768	60	32
Los Angeles	8,964	1,690	1,069	127
Madera	214	8	27	1
Merced	287	169	41	8
Monterey	1,078	1,202	18	7
Napa	61	101	0	0
Nevada	430	60	247	9
Orange	1,041	938	1,142	123
Placer	31	38	1	1
Plumas	138	73	6	1
Riverside	1364	162	732	172
Sacramento	46	13	20	3
San Benito	677	390	1	1
San Bernardino	4,729	701	761	178
San Diego	7,693	1,743	1,866	260
San Joaquin	814	85	13	9
San Luis Obispo	1429	967	90	34
Santa Barbara	2,672	1,398	906	133
Santa Clara	59	81	67	8
Santa Cruz	2,062	450	220	54
Shasta	9,504	620	899	153
Solano	367	196	135	13
Stanislaus	924	175	82	21
Sutter	74	35	0	0
Tehama	390	284	456	79
Toulumne	221	45	0	0
Tulare	12	25	0	0
Ventura	4,585	982	1,890	200
Yolo	300	104	108	13

Note:
UCMP = University of California Museum of Paleontology at Berkeley
Source: UCMP, n.d.

16.2.2 Secondary Study Area

16.2.2.1 Geology

The Secondary Study Area occurs primarily in the eastern portion of the Coast Range Geomorphic Province and the northwestern portion of the Great Valley Geomorphic Province (Figure 16-1). Additionally, portions of the Klamath Mountains, Cascades, Modoc Plateau, Basin and Range, and the Sierra Nevada geomorphic provinces are within the Secondary Study Area. These are described below.

Coast Range Geomorphic Province

The Coast Range Geomorphic Province is characterized by a series of north-northwest trending ranges and valleys; few are continuous for more than 100 miles. The province extends approximately 600 miles from Point Arguello northward to the Klamath Range (Norris and Webb, 1990) and varies in width from a few miles to 70 miles.

The Coast Ranges are complex and consist of many types of rocks ranging in age from Jurassic (206 MYA) to Tertiary (present time). The Franciscan Formation is composed of metamorphosed sedimentary and igneous rocks. It represents the basement rocks of the Coast Ranges to the west of the project area. The general structural trend is northwest.

The eastern portion of the Coast Range is composed of a thick sequence of Upper Mesozoic (65 to 145 MYA) sedimentary rocks known as the Great Valley Sequence (GVS). The section consists principally of sedimentary rocks that are folded and faulted, and are not affected by other than mild metamorphism. The GVS is divided into several formations that are generally based upon particle size. Although the naming system for these formations has been subject to many revisions (e.g., Blake et al., 1992; Dickinson and Rich, 1972; Rich, 1971; Ingersoll, 1979), for this study, the pertinent formations of the GVS (from oldest to youngest) include the Stony Creek, Lodoga, Boxer, Venado, Cortina, and Yolo. Quaternary (1.8 MYA to Present) units in the Coast Range include stream deposits consisting of clay, silt, sand, gravel, cobbles, and boulders found in recent stream channels. Stream deposits are derived from the older components of the Franciscan Complex and the GVS. Hillside deposits occur along slopes or at their bases. It consists of soil, but contains a sizable fraction of angular rock fragments and some organic material. Landslide deposits are similar to hillside deposits, but are more defined and generally deeper. Landslide deposits tend to occur on steeper slopes.

Great Valley Geomorphic Province

The Great Valley Geomorphic Province is a nearly flat alluvial plain extending from the Tehachapi Mountains in the south to the Klamath Mountains in the north; to the Sierra Nevada in the east and the Coast Ranges in the west. The valley consists of the San Joaquin River drainage to the south of the Sacramento-San Joaquin Delta, and the Sacramento River drainage to the north. This northwest-trending trough has been filled with a thick (several miles deep) (Wahrhaftig and Birman, 1965) accumulation of sediments eroded from the adjacent ancestral Sierra Nevada and Klamath Mountain ranges from the Jurassic to the Present. It has a long stable eastern shelf supported by subsurface granite and a short western flank with basin sediments. The western edge has eroded to form a series of northwest-trending eastward-dipping ridges of sandstone and conglomerate separated by valleys underlain by siltstone and mudstone.

Rock units on the surface in the Great Valley Geomorphic Province close to the Secondary Study Area range in age from Miocene to Recent (23.8 MYA to Present).

The Lovejoy basalt is a dense and very hard extrusive volcanic rock (i.e., lava flow). The basalt originated approximately 23 million years ago from an unknown volcanic center near the eastern margin of the Sierra Nevada. Lovejoy exposures are found in the Orland Buttes on the west side of the Central Valley and as far south as Vacaville. Extensive outcrops of the Lovejoy are located in the Oroville area.

The Tehama Formation occurs as thin, discontinuous, and deeply weathered stream-transported fan deposits throughout the western edge of the Sacramento Valley that were derived from the erosion of the Coast Ranges and Klamath Mountains. Eastward, the deposits thicken and merge, forming a broad thick plain that contains pale green to tan semi-consolidated sand, tuffaceous[8] sand, and silt with lenses of gravel. The Tehama Formation is the primary groundwater aquifer of the Sacramento Valley west of the Sacramento River. The Nomlaki Tuff Member occurs near the bottom of the Tehama Formation and has been age-dated at approximately 3.3 million years. It consists of white, tan, or pink dacite pumice tuff and lapilli tuff that is approximately 30 feet thick along the west side of the valley. Most of the tuff is believed to have been deposited as an ash fall from a major volcanic eruption east of the project region.

The Red Bluff Formation occurs primarily in the northern portion of the Sacramento Valley, where it overlies the Tehama Formation. Its largest area is in the vicinity of the City of Red Bluff where it is approximately 50 feet thick. It consists largely of gravels with minor amounts of interbedded sands. The upper surface usually consists of a hardpan soil. In the Red Bluff area, rock fragments are metamorphic and igneous types, indicating that the sediments were transported from the north Coast Ranges and Klamath Mountains. The formation was probably deposited during a period when glaciers were active in the adjacent mountain areas. Streams draining the glacial areas were heavily choked with coarse debris and suspended fine-grained material. The suspended clay and silt particles filled the voids after deposition of the gravel so that most of the Red Bluff gravels are not very permeable. The Red Bluff remnants represent an extensive Pleistocene (1.8 MYA to 11,600 years ago) nearly level erosional surface that once covered much of the northern Sacramento Valley.

The Riverbank Formation consists of weathered reddish gravel, sand, and silt. It is differentiated from the younger Modesto Formation by its terraces being higher topographically and by its more developed soil profile. The upper layer is unconsolidated, but compact dark brown to red alluvium and forms the lower of the Riverbank terraces. The lower layer is a red semi-consolidated gravel, sand, and silt. Its surface is higher topographically and more dissected than the upper layer and has a stronger soil profile.

The Modesto Formation consists of the lowest distinct alluvial terraces lying above the Holocene (11,600 years ago to Present) stream deposits. It includes tan and light gray gravelly sand, silt, and clay. The upper layer is unconsolidated and unweathered, and it forms the lowest terraces approximately ten feet thick over older alluvial deposits. The lower layer can be slightly weathered and forms terraces that are higher than the upper layer. Soils on the lower layer contain clay and are red.

Recent stream channel deposits, floodplain, and flood basin deposits make up the remainder of rock types that crop out in the Sacramento Valley. Stream channel and floodplain deposits consist of well-sorted sand, gravel, and silt adjacent to the major streams. Flood basin deposits are the finest grained materials, consisting mostly of clay and silt. The deposits are thin and poorly permeable. Flood basin deposits in the project area occur in the Colusa Basin along the west side of the Sacramento River from approximately Princeton southward.

The Tuscan and Laguna formations, important water-bearing formations beneath the Sacramento Valley, crop out along the eastern portion of the Sacramento Valley. Further discussion of these formations is included in Chapter 10 Groundwater Resources.

Klamath Mountains Geomorphic Province

The Klamath Mountain Geomorphic Province is divided into four north-south trending terranes[9]. From east to west, these terranes are the Eastern Klamath, Central Metamorphic, Western Paleozoic and

[8] Tuffaceous sand is a rock composed of compacted volcanic ash varying in size from fine sand to coarse gravel.

[9] Terranes are areas having a preponderance of a particular rock or rock groups.

Triassic, and Western Jurassic. The terranes increase in age from west to east, except for the Central Metamorphic Terrane, which is slightly older than the Eastern Klamath Terrane. The rock units generally dip to the east, with the older eastern units overlying the younger western units. To varying degrees, these rock units are exposed throughout the 40-mile reach of the mainstem Trinity River. Older gold-bearing stream channel deposits, as well as recent channel deposits, occur along rivers and creeks.

Cascades Geomorphic Province

The Cascades Geomorphic Province, from southern British Columbia to south of Lassen Peak, is a volcanic terrane ranging in age from Pliocene to Holocene. The province has been divided into the Western Cascade series and the High Cascade series. The Western Cascade series consists of Miocene-aged basalts, andesites, and dacite flows interlayered with rocks of explosive origin, including rhyolite tuff, volcanic breccia, and agglomerate. This series is exposed at the surface in a belt 15 miles wide and 50 miles long from the Oregon border to the town of Mount Shasta. Early High Cascade rocks formed very fluid basalt and andesite that extruded from fissures to form low shield volcanoes. Large composite cones like Mount Shasta and Mount Lassen had their origins during the Pleistocene. Mount Lassen was the only active volcano in California in the 20th century. Mount Shasta was last active in the 18th century when steam and ash erupted from the summit cone (Norris and Webb, 1990).

Modoc Plateau Geomorphic Province

The Modoc Plateau Geomorphic Province consists of a high plain of irregular volcanic rocks of basaltic origin. The numerous shield volcanoes and extensive faulting on the plateau give the area more relief than may be expected for a plateau. The Modoc Plateau averages 4,500 feet in elevation and is considered a small part of the Columbia Plateau, which covers extensive areas of Oregon, Washington, and Idaho.

Basin and Range Geomorphic Province

The Basin and Range Geomorphic Province, located east of the Modoc Plateau and the Sierra Nevada, extends eastward into western Utah. It is characterized as north-south trending mountain ranges separated by low wide alluvial valleys derived from eroded materials from the adjacent mountain ranges. In general, the drainage is internal (i.e., no outlet to the sea) with saline lakes occupying low spots. One area, the Sierra Valley, drains westward into the Middle Fork Feather River. Rocks range from metamorphic rocks of pre-phanerozoic age (approximately 1.8 billion years ago to Recent) lakebed and stream deposits. Paleozoic and early Mesozoic sedimentary and metamorphic rocks constitute the bulk of the bedrock. The topography of the Basin and Range is a result of crustal extension within this part of the North American Plate. The crust has been stretched up to 100 percent of its original width, and underneath the Basin and Range, it is of the thinnest in the world.

Sierra Nevada Geomorphic Province

The Sierra Nevada Geomorphic Province is comprised principally of Cretaceous granitic pluton[10], remnants of Paleozoic and Mesozoic metavolcanic and metasedimentary rocks, and Cenozoic volcanic and sedimentary rocks. The Paleozoic and Mesozoic metavolcanic and metasedimentary rocks were intruded by the granitic plutons approximately 77 to 225 MYA, resulting in local uplift and deformation of the overlying older rock. Regional uplift and rapid erosion of most of the overlying metamorphic rocks closely followed intrusion of the plutons, exposing the underlying granitic rocks. Continued uplift and

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[10] Plutons are masses of igneous rock that have solidified below the surface of the earth.

erosion, accompanied by volcanic activity and alpine glaciation, resulted in the present pattern of deep-walled valleys that characterize the Sierra Nevada.

16.2.2.2 Minerals

The mineral resources within the Secondary Study Area are the same as was described for the Extended Study Area. The exceptions are iron and gypsum, which are mined in southern California, but are not found in the Secondary Study Area.

The Stony Creek Fan in Glenn County has an estimated aggregate material availability of 160 million cubic yards (DWR, 2002).

Ultramafic rocks, possibly containing localized veins of asbestos, occur in the Coast Ranges, Klamath Mountains, and the Sierra Nevada (CGS, 2000a). Chromite was mined intermittently from ultramafic rocks in Glenn County in the vicinity of the town of Chrome. Mining activity ceased in the 1940s.

16.2.2.3 Soils

Soils in the western portion (i.e., the Coast Range foothills) of the Secondary Study Area are a byproduct of erosion of the underlying sedimentary rocks. Typical foothill soils are shallow to deep, generally well-drained, and fine- to medium-textured. Soil depth on steep slopes is moderate to very thin; slightly weathered sandstone and intensely weathered mudstones can be encountered within just a few inches of the surface. Soil depth increases on the gentler slopes, generally reaching its maximum thicknesses along valley bottoms. These deeper soils are more developed, moderately drained, and finer-grained; organic material is more common in the low-lying deeper soils.

Soils in the central portion (i.e., the Sacramento Valley) of the Secondary Study Area are a byproduct of the underlying weathered alluvial deposits. Most valley soils are alluvial silt loams, clays, and sands deposited by the Sacramento River and tributaries draining the west side of the valley. These soils are typically very deep to moderately deep, poorly drained, and fine-textured. The majority of the alluvial soils on the valley floor has high agricultural productivity and is designated as Prime Agricultural[11] soils. Some soils are limited in their ability to support many forms of agriculture because of alkali problems and/or drainage problems caused by the presence of a cemented hardpan or dense clay layer. These poorly drained soils are particularly well suited for growing rice.

Soils in the northern and eastern portions of the Secondary Study Area (i.e., the Klamath, Cascades, and Sierra Nevada) are a byproduct of the underlying metamorphic, volcanic, and intrusive rocks. In general, they are more clay-rich than the alluvial soils of the Sacramento Valley.

16.2.2.4 Paleontology

Table 16-2 shows the fossil locations and number of fossils found in the Secondary Study Area. As in the Extended Study Area, the recovered fossils range from microfossils to the bones of large mammals. Several counties contain more fossil localities than actual fossils because not all fossils from known localities have been added to the database at this time (the localities have been listed, but the specimens from those sites have yet to be entered into the database). Construction activities in the Secondary Study Area are limited to the installation of a new pump at the Red Bluff Pumping Plant, and maintenance activities are limited to the dredging of the intakes; neither operation will involve excavation into

[11] Prime Agricultural means that the soil meets the physical and chemical criteria for Prime Farmland or Farmland of Statewide Importance, as determined by the USDA Natural Resources Conservation Service (NRCS).

sediments with the potential to yield fossils. Because these activities are not expected to affect paleontological resources, a full paleontological inventory review of the Secondary Study Area was not conducted.

Table 16-2
Fossils and Fossil Locations within the Secondary Study Area

County	UCMP Database		PaleoBiology Database	
	Fossils	Localities	Species	Localities
Alameda	1,520	401	63	12
Butte	136	130	100	23
Colusa	67	138	25	4
Contra Costa	10,712	2,446	0	0
Del Norte	4	65	18	3
El Dorado	360	22	0	0
Glenn	21	73	28	5
Humboldt	3,522	782	96	8
Marin	377	342	38	8
Placer	31	38	1	1
Sacramento	46	13	20	3
San Francisco	34	122	4	3
San Mateo	405	730	124	16
Santa Clara	59	82	67	8
Shasta	9,504	620	899	153
Solano	367	196	135	13
Sonoma	301	504	20	8
Sutter	74	35	0	0
Tehama	390	284	456	79
Trinity	118	32	0	0
Yolo	300	104	108	13
Yuba	0	3	0	0

Note:
UCMP = University of California Museum of Paleontology at Berkeley
Source: UCMP, n.d.

16.2.3 Primary Study Area

16.2.3.1 Geology

Table 16-3 lists the Coast Range rock units and the Sacramento Valley rock units within the Primary Study Area. Figure 16-2 is a generalized geologic map of the Primary Study Area (CGS, 2000b). Detailed mapping of the rock units within the Sacramento Valley (Helley and Harwood, 1985) is shown in Figure 16-3.

Table 16-3
Coast Range Rock Units in the Primary Study Area

<table>
<tr><th colspan="3">Coast Range Rock Units</th></tr>
<tr><th>Geologic Period</th><th colspan="2">Rock Unit</th></tr>
<tr><td>Quaternary
1.8 MYA to Present</td><td colspan="2">Stream channel deposit, slope wash, landslide deposits</td></tr>
<tr><td>Upper Cretaceous
65 to 100 MYA</td><td>Cortina Formation
(Includes Venado and Sites sandstone members
Boxer Formation</td><td rowspan="2">Franciscan Formation</td></tr>
<tr><td>Lower Cretaceous
100 to 145 MYA</td><td>Lodoga Formation
Stony Creek Formation</td></tr>
<tr><th colspan="3">Great Valley Rock Units</th></tr>
<tr><th>Geologic Period</th><th>Geologic Epoch</th><th>Rock Unit</th></tr>
<tr><td>Quarternary</td><td>Holocene
11,600 years ago to Present</td><td>Stream channel deposits
Flood plan deposits
Basin deposits</td></tr>
<tr><td rowspan="3">Tertiary</td><td>Pleistocene
2.6 MYA to 11,600 years ago</td><td>Upper Modesto Formation
Lower Modesto Formation
Upper Riverbank Formation
Lower Riverbank Formation
Red Bluff Formation</td></tr>
<tr><td>Pliocene
5.3 to 1.8 MYA</td><td>Tehama Formation</td></tr>
<tr><td>Miocene
23.8 to 5.3 MYA</td><td>Lovejoy Basalt</td></tr>
</table>

Sites Reservoir Inundation Area, Sites Reservoir Dams, and Recreation Areas

Sites Reservoir and its dams would be located in sedimentary rocks of the GVS. The GVS is composed of Jurassic-Cretaceous marine sandstones, siltstones, and mudstones trending north by northwest and dipping steeply to the east. Older sedimentary rocks of the GVS occur to the west, and younger sedimentary rocks occur to the east.

Within the footprint of the Sites Reservoir, the GVS is primarily composed of the Boxer Formation. The Boxer Formation consists of thinly bedded mudstones with thin to medium sandstone/siltstone. The mudstone of the Boxer Formation is more erodible than the sandstone, thus forming the broad gentle relief of the Antelope Valley. The saddle dam foundations along the northeastern portion of the reservoir would be sited in the Boxer Formation.

The prominent ridge along the eastern shore of Sites Reservoir is formed from the contact between the underlying Boxer Formation and the more resistant Cortina Formation. The Cortina Formation consists of a greater proportion of sandstone, with moderate to thick mudstone interlayers. The basal member of the Cortina Formation, the Venado Sandstone, is the geologic unit in which the Golden Gate Dam and the Sites Dam foundations would be built.

Younger deposits of Late Quaternary (8,000 year ago to Present) deposits occur within the Sites Reservoir footprint, primarily along the stream valleys of Stone Corral Creek, Antelope Creek, Funks Creek, and Grapevine Creek in Antelope Valley. The deposits are composed primarily of fine-grained sands, silts, and clays derived from the surrounding Boxer Formation. Larger fragments of igneous and metamorphic rock occur in the deposits and are derived from upland areas west of the valley. They generally occur as stream channel and floodplain deposits; minor colluvium deposits occur on higher gentler slopes away from the streams. Floodplain deposits typically contain beds of sandy gravel and silty sand. Stream channel deposits consist of sandy silt and gravel inset into either the floodplain or terrace deposits. In general, the deposits are rather thin (less than 30 to 50 feet) with a maximum thickness reached adjacent to the downcut stream channels on the eastern side of Antelope Valley.

The five recreation areas would be located on either the Boxer Formation or the Cortina Formation.

Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard

The Sites Generating/Pumping Plant would be sited on the eastern slope of a prominent ridge composed of sandstones and mudstones of the Cortina Formation. Quaternary alluvium covers the alignment trace of the intake canal. The tunnel alignment would be in mostly Cortina Formation mudstones and sandstone, except for its western opening which would be in mudstones of the Boxer Formation. The Inlet/Outlet Structure would be sited in the Boxer Formation. The Sites Electrical Switchyard would be sited in sandstone of the Cortina Formation. The Field Office Maintenance Yard would be sited primarily in sandstone with occasional thin beds of mudstone of the Lodoga Formation.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Bedrock within and surrounding the existing Funks Reservoir is composed primarily of thinly bedded mudstones of the Yolo Member of the Cortina Formation. Due west of Funks Reservoir, the Sites member of the Cortina Formation is older geologically, and occurs as a more resistant ridge of thin to medium bedded sandstone and siltstones. Typically, the mudstone members are more susceptible to weathering and erosion, forming broad low valleys or swales between the more resistant sandstone. A more resistant outcrop of sandstone occurs near the downstream portion of Funks Reservoir in the vicinity of the existing Funks Dam. The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would be sited in thinly bedded mudstones of the Yolo Member of the Cortina Formation. Younger deposits of the Late Quaternary (8,000 year ago to Present) occur on top of the bedrock around and inundated by Funks Reservoir; the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would also be sited on these deposits.

Glenn-Colusa Irrigation District Canal

Geologic units along the alignment trace of the GCID Canal consist of (from youngest to oldest) the Basin Deposits, Upper and Lower Modesto Formation, and Upper and Lower Riverbank Formation. Descriptions of these geologic units are included in Section 16.2.2.1.

The GCID Canal headworks are located on the Lower Riverbank Formation. From approximately one mile south of the headworks to Stony Creek, the Canal then crosses the Lower Modesto Formation. Between Stony Creek and Willows, the Canal crosses the Upper and Lower Modesto Formation and the Riverbank Formation, as well as basin deposits. From Willows south to the Funks Reservoir, the Canal crosses primarily basin deposits and isolated deposits of Upper Modesto Formation and Upper Riverbank Formation.

Tehama-Colusa Canal

Geologic units along the alignment of the T-C Canal consist of (from youngest to oldest) the Basin Deposits, Upper and Lower Riverbank Formation, Upper and Lower Modesto Formation, Red Bluff Formation, Tehama Formation, and Cortina Formation. Descriptions of these geologic units are included in Section 16.2.2.1.

From Willow Creek to Funks Reservoir, the Canal crosses primarily deeply weathered mudstones, siltstones, and minor thin beds of sandstone of the Cortina Formation between drainage divides and younger alluvium or basin deposits at stream crossings.

Delevan Pipeline and Delevan Transmission Line

Geologic units along the alignment of the Delevan Pipeline consist of (from youngest to oldest) recent Sacramento River stream deposits, Basin Deposits, Lower Riverbank Formation, Lower Modesto Formation, and Cortina Formation. Descriptions of these geologic units are included in Section 16.2.2.1.

Terminal Regulating Reservoir, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, Terminal Regulating Reservoir Pumping/Generating Plant, and Terminal Regulating Reservoir Electrical Switchyard

Geologic units underneath and adjacent to the proposed location of the TRR, GCID Canal Connection to the TRR, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, TRR Pumping/Generating Plant, and TRR Electrical Switchyard consist of Basin Deposits and the Lower Riverbank Formation. Descriptions of these geologic units are included in Section 16.2.2.1.

Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility

Geologic units underneath the proposed location of the Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility consist of recent Sacramento River stream deposits, Lower Modesto Formation, and the Tehama Formation. Descriptions of these geologic units are included in Section 16.2.2.1. The stream deposits and Lower Modesto Formation are relatively thin (less than 20 feet) and are underlain by the more resistant Tehama Formation. The Tehama Formation is less readily erodible and defines the western edge of the Sacramento River channel.

Road Relocations and South Bridge

Geologic units underneath the proposed location of the road relocations consist of the Boxer and Cortina Formations of the GVS (Section 16.2.2.1). Additionally, these older deposits are occasionally overlain by younger sedimentary deposits of Late Quaternary (8,000 year ago to Present).

Project Buffer

Geologic units underneath the portion of the Project Buffer that would surround Sites Reservoir and the inlet/outlet facilities, as well as the Holthouse Reservoir Complex, consist primarily of the Boxer and Cortina formations of the GVS (Section 16.2.2.1), with smaller portions of Basin Deposits, upper and lower members of both the Riverbank and Modesto formations, and Red Bluff Formation.

Geologic units underneath the portion of the Project Buffer that would surround the TRR facilities consist of Lower Riverbank Formation, Basin Deposits, and Red Bluff Formation.

Geologic units underneath the portion of the Project Buffer that would surround the Delevan Pipeline Intake/Discharge Facilities consist of Lower Modesto Formation and recent Sacramento River stream deposits.

16.2.3.2 Minerals

With the exception of an inactive dimensional stone quarry to the east of the proposed Sites Dam location, no known economic mineral resources occur in Primary Study Area. No locally important mineral resources exist within the Primary Study Area (Glenn County, 1997 and Colusa County, 1989).

Natural gas production occurs widely in the Primary Study Area with large gasfields in the Sacramento Valley, such as the Willows-Beehive Bend Field. Between 1948 and 1972, 10 exploratory wells were drilled within the footprint of the proposed Sites Reservoir; all 10 wells were “dry holes” (i.e., produced no natural gas). Approximately 10 exploratory wells (all “dry holes”) were also drilled near the alignment of the Delevan Pipeline.

Ultramafic rocks possibly containing localized veins of asbestos are not found within the Primary Study Area or in watersheds draining into the Primary Study Area (CGS, 2000a).

16.2.3.3 Soils

The soils in the Primary Study Area have been mapped by the U. S. Department of Agriculture, Soil Conservation Service (now the NRCS), and are described in the soil surveys of Colusa and Glenn counties (NRCS, 2006 and Begg, 1965). In addition, the NRCS provides soil data in GIS format and software (Soil Data Viewer) for detailed analysis of soil properties.

The Primary Study Area includes two physiographic provinces: the Sacramento Valley and the Coast Range foothills (NRCS, 2006).

Floodplains extending along both sides of the Sacramento River slope gently away from the river to the Butte Sink to the east and Colusa Basin to the west. Frequent overflows under natural conditions have deposited loamy soils high in content of silt and fine sand. A levee system combined with Shasta Reservoir upstream helps to control Sacramento River waters so that floodplains are no longer flooded on a regular basis.

The soils on the floodplains along the Sacramento River are very fertile and are among the best soils in the Sacramento Valley. Several sloughs originally disseminated from the Sacramento River into the Butte Sink and Colusa Basin. Water flow was stopped by construction of levees on the Sacramento River. These sloughs, particularly the Sycamore Slough, carried river sediments several miles from the river, creating the very productive Vina soils. West from the floodplains along the Sacramento River, the Colusa Basin extends north and south through the Primary Study Area. Overflows containing clayey sediments from the Sacramento River and foothill streams regularly filled the Colusa Basin. Because of the construction of levees on the Sacramento River, only sediments from the foothill streams now reach the basin. The basin is mostly leveled for rice production. Salts in the clayey sediments from the foothill streams were deposited in the basin soils, particularly Willows soils, and reclamation of the soils has been ongoing since early in the 20th century. Most basin soils have been reclaimed to several feet. The very deep clay deposits that are characterized by extremely slow permeability and a shallow water table hamper further reclamation.

Alluvial fans exist along the west side of the Sacramento Valley. They originate at the base of the foothills, at elevations of 200 to 400 feet, and gently descend to the east for several miles to the Colusa Basin. Under natural conditions, streams from the foothills flooded these alluvial fans, depositing fertile loamy soils. Many of the streams have been diverted from their natural channels, and levees have been constructed in some areas to control flooding.

Most of the foothill region is drained by streams flowing east to the Sacramento Valley. These streams occasionally carry heavy volumes from high rainfall events, and cause flooding in the Sacramento Valley along the west-side alluvial fans and in the Colusa Basin. Increased runoff has scoured and lowered the stream channels of many foothill streams. Some streams have been diverted or channelized in the Sacramento Valley. The foothill streams eventually find their way to the Colusa Basin and to the Colusa Basin Drain. Occasionally, the flow exceeds the capacity of the south-flowing Colusa Basin Drain, and widespread flooding occurs in the basin.

The Coast Range foothills range from approximately 200 to 2,500 feet in elevation. The lower foothills have rolling slopes in many areas and have clayey soils and very few oak trees. In most foothill areas, the soils are strongly sloping and are shallow or moderately deep over sandstone and mudstone of the Great Valley Sequence. Most small valleys in the foothills have gently sloping clayey soils and some areas of loamy soils.

The NRCS has mapped 61 soil types within the Primary Study Area. Appendix 16A provides the soil map unit name, the county in which it occurs, a map unit description, and several soil properties, such as erosion potential, shrink/swell potential, corrosion of steel potential, and corrosion of concrete potential. Soil property values were derived using the NRCS Soil Data Viewer software.

Sites Reservoir Inundation Area (1.27 MAF and 1.81 MAF)

Thirty-four soil types occur within the proposed Sites Reservoir footprint for Alternative A (1.27 MAF). Of these, 13 soil types make up approximately 92 percent of the total area (Table 16-4). The remaining 21 soil types make up less than eight percent of the total area.

Table 16-4
Major Soil Types at Sites Reservoir (Alternative A)

Soil Type	Acreage	Percent of Total	Cumulative Percent of Total
Capay clay	2,961.7	24.25	24.25
Altamont-Sehorn complex	2,315.8	18.96	43.20
Sehorn-Altamont complex	1,872.8	15.33	58.54
Corval loam	1,529.4	12.52	71.06
Altamont silty clay	841.4	6.89	77.94
Corning clay loam	348.9	2.86	80.80
Millsholm-Contra Costa association	311.4	2.55	83.35
Altamont-Contra Costa clays	193.8	1.59	84.94
Hillgate loam	191.2	1.57	86.50
Clear Lake clay	176.5	1.44	87.95
Zamora silty clay	174.2	1.43	89.37
Myers clay	172.4	1.41	90.78
Millsholm-Rock outcrop association	160.1	1.31	92.09

Thirty-six soil types occur within the proposed Sites Reservoir footprint for Alternatives B and C (both are 1.81 MAF). Of these, 15 soil types make up approximately 93 percent of the total area (Table 16-5). The remaining 21 soil types make up less than seven percent of the total area.

Table 16-5
Major Soil Types at Sites Reservoir (Alternatives B and C)

Soil Type	Acreage	Percent of Total	Cumulative Percent of Total
Capay clay	3,070.7	21.49	21.49
Altamont-Sehorn complex	2,633.9	18.43	39.92
Sehorn-Altamont complex	2,441.7	17.09	57.01
Corval loam	1,608.8	11.26	68.27
Altamont silty clay	902.7	6.32	74.58
Millsholm-Contra Costa association	527.7	3.69	78.28
Corning clay loam	357.3	2.50	80.78
Altamont-Contra Costa clays	324.6	2.27	83.05
Millsholm-Rock outcrop association	315.1	2.21	85.25
Myers clay	214.8	1.50	86.76
Hillgate loam	192.9	1.35	88.11
Altamont soils	192.5	1.35	89.45
Zamora silty clay	178.6	1.25	90.70
Clear Lake clay	176.5	1.24	91.94
Nacimiento-Contra Costa association	164.9	1.15	93.09

Sites Reservoir Dams

Fourteen soil types occur within the footprints of the Sites Dam, Golden Gate Dam and associated small saddle dam, and the six northern saddle dams for Alternative A. The Sites Dam location is predominantly underlain by the Millsholm-Contra Costa association soil type (14.3 acres) and a smaller amount of Corval loam (1.0 acre). The Golden Gate Dam and associated small saddle dam locations are underlain entirely by the Millsholm-Rock outcrop association soil type (41.0 acres). The six northern saddle dam locations are underlain primarily by Nacimiento-Contra Costa association (15.2 acres), Capay clay (11.0 acres) and Altamont soils (5.6 acres) with lesser amounts of Zamora silty clay (2.8 acres), Sehorn-Millsholm association (1.0 acre), and Millsholm very rocky sandy loam, Willows clay, Tehama clay loam, Altamont-Contra Costa clays, and Myers clay (each less than 0.5 acre).

The same fourteen soil types occur within the footprints of the Sites Dam, Golden Gate Dam, and nine northern saddle dams for Alternatives B and C. The Sites Dam location is predominantly underlain by the Millsholm-Contra Costa association soil type (18.1 acres) and a smaller amount of Corval loam (1.2 acres). The Golden Gate Dam location is underlain by the Millsholm-Rock outcrop association soil type (15.1 acres), the Capay clay (10.8 acres), the Corval loam (10.4 acres), and lesser amounts of Millsholm-Contra Costa association (0.6 acre) and Sehorn-Altamont complex (0.05 acre) soil types. The nine northern saddle dam locations are underlain primarily by Nacimiento-Contra Costa association (37.1 acres), Capay clay (20.0 acres), Altamont soils (17.0 acres), Sehorn-Millsholm association (8.1 acres), Altamont-Contra Costa clay (3.2 acres) and Sehorn-Altamont complex (3.0 acres) with lesser amounts of Zamora silty clay (2.6 acres), and Tehama clay loam, Willows clay, Millsholm-Rock outcrop association, and Sehorn-Millsholm-Gullied land complex (each less than 1.6 acres).

Soil cover at the proposed Sites and Golden Gate damsites is very thin and is derived from the interbedded sandstone and siltstones of the Venado Sandstone. Soil cover at the seven (Alternative A) and nine (Alternatives B and C) saddle damsites is moderately deep with gradual transition into the mudstones and siltstones of the Boxer Formation.

Recreation Areas

The Recreation Areas would be underlain predominantly by Sehorn-Altamont complex (302.9 acres), Millsholm-Contra Costa association (264.8 acres), Nacimiento-Contra Costa association (217.0 acres), Millsholm-Contra Costa complex (129.1 acres), Altamont-Sehorn complex (119.5 acres), and Capay clay (96.0 acres) soils. The remaining 74.1 acres would be underlain by five other soil types in lesser amounts.

Road Relocations and South Bridge

The Road Relocations and South Bridge (including a 200-foot-wide construction disturbance area) would be underlain by 43 different soil types. Total affected area is approximately 1,329 acres. The predominant soil types are Millsholm-Contra Costa association (273.1 acres), Sehorn-Altamont complex (234.9 acres), and Capay clay (210.7 acres). The remaining 610.6 acres are composed of 40 other soil types with acreages ranging from 79.5 acres to 0.1 acre.

Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard

The Sites Pumping/Generating Plant would be located within the footprint of the proposed Inlet/Outlet Structure. The Tunnel would be entirely underground with openings in the outlet and inlet structures. The Inlet/Outlet Structure would be underlain predominantly by Millsholm-Rock outcrop association (34.7 acres), Corval loam (24.1 acres), and Sehorn-Altamont complex (15.0 acres) soils, with lesser amounts of Capay clay (8.7 acres), and Millsholm-Contra Costa association (7.6 acres) soils. Nearly 10 acres of Inlet/Outlet structure would be located in the footprint of the existing Funks Reservoir; no NRCS soils data are available for that area. The Sites Electrical Switchyard would be underlain by the Millsholm-Rock outcrop association. The Field Office Maintenance Yard would be underlain almost entirely by the Millsholm-Rock outcrop complex (18.0 acres) with a small portion by Capay clay (0.3 acre).

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

No NRCS soils data are available for the footprint of the existing Funks Reservoir. The proposed Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would be underlain predominantly by Capay clay (129.2 acres) and Capay clay loam (74.0 acres) soils with lesser amounts of Hillgate clay loam (62.2 acres), Altamont-Sehorn complex (39.8 acres), Corval clay loam (36.1 acres), and Altamont silty clay (18.9 acres).

Terminal Regulating Reservoir, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, and Terminal Regulating Reservoir Electrical Switchyard

The TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, and TRR Electrical Switchyard would be underlain by Capay clay loam (114.2 acres) and Hillgate clay loam (90.6 acres) soils, with 4.7 acres of Corval clay loam.

Glenn-Colusa Irrigation District Canal Facilities Modifications

The three modifications are primarily within the footprint of the existing GCID Canal; soil data within the footprint is unavailable (i.e., noted as water on soil map). At the railroad siphon location, Myers clay is present on both sides of the Canal. At the new headgate location, Hillgate loam is present on both sides of the Canal. The 200-foot canal lining feature is entirely within the footprint of the existing GCID Canal.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

The Delevan Pipeline would be underlain predominantly by Willows silty clay (96.5 acres) and Hillgate clay loam (51.8 acres) with lesser amounts of Capay clay loam (28.0 acres), Corval clay loam (23.2 acres), Moonbend silt loam (8.5 acres), Corbiere silt loam (6.4 acres), and Vina loam (2.1 acres).The construction disturbance area for the Delevan Pipeline (totaling approximately 2,365 acres) would be underlain predominantly by Willows silty clay (1,175.6 acres), Hillgate clay loam (379.8 acres), Capay clay loam (277.3 acres), Corval clay loam (247.3 acres), Moonbend silt loam (101.3 acres), and Corbiere silt loam (84.9 acres). Six other soil types make up the remaining 86 acres in lesser amounts.

The TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard would be underlain predominantly by Hillgate clay loam (6.5 acres) with a lesser amount of Capay clay loam (2.1 acres). The construction disturbance area for these three facilities would be entirely within the construction disturbance area of the Delevan Pipeline.

Delevan Transmission Line

The Delevan Transmission Line route would be located within the construction disturbance area of the Delevan Pipeline, except for a four-mile portion extending west of the proposed TRR. This discussion addresses only that portion of the transmission line outside of the Delevan Pipeline construction disturbance area. The proposed Delevan Transmission Line route (west of the TRR) would be underlain predominantly by Altamont silty clay (23.6 acres), Corval loam (9.5 acres), Millsholm-Rock outcrop association, (8.3 acres), Capay clay (5.8 acres), and Altamont-Sehorn complex (5.4 acres). Seven other soil types make up the remaining 20.6 acres in lesser amounts.

Delevan Pipeline Intake Facilities (Alternative A and C)

The proposed Delevan Pipeline Intake Facilities would be underlain by Vina loam (17.4 acres). A portion of the facility (1.7 acres) would extend into the river; no NRCS soils data are available for that area.

Delevan Pipeline Discharge Facility (Alternative B)

The proposed Delevan Pipeline Discharge Facility would be underlain by Vina loam (7.64 acres). A portion of the facility (0.1 acre) would extend into the river; no NRCS soils data are available for that area.

Project Buffer

The Project Buffer would surround all Primary Study Area Project facilities, with the exception of the Delevan Pipeline, Delevan Transmission Line, portions of the roads, and the GCID Canal Facilities Modifications. The soil types underlying the Project Buffer are, therefore, similar to soils described above for the facilities that it would surround.

16.2.3.4 Paleontology

Methodology

Geological maps and geological literature were reviewed to provide the physiographic and geological context for the Primary Study Area. Internet queries and two standard online databases were also used to determine the relative potential for paleontological resources to be found in each of the rock units described below. The databases are the University of California Museum of Paleontology at Berkeley (UCMP, n.d.), and the Paleobiology Database (n.d.), managed by a consortium of academic institutions and supported, in part, by the National Science Foundation. The results of the search of paleontological site records are presented in Appendix 16B.

The following tasks were completed to establish the paleontologic sensitivity and distribution of rock units (including unconsolidated sediments) exposed within the Primary Study Area:

- The study area was defined and its physiographic and geologic context was described.
- A stratigraphic inventory (i.e., a review of the composition and relative positions of the rocks) of the area was completed, and the mapped geologic units within the Primary Study Area were identified.
- A paleontological records review of the area was completed to identify previously recorded fossil resources and the context of their discovery.

The mapped geologic units were assigned levels of paleontological sensitivity based on the fossil remains previously documented within that unit and on other relevant geological and paleontological data.

The paleontological sensitivity of the Primary Study Area was assessed by identifying the geological units that might yield fossils, and therefore, have paleontological potential using the approach described above. A description of the geological units is provided above; Appendix 16C presents the results of the review of the available geological literature focused on paleontological sensitivity assessment.

The distribution of stratigraphic units was determined through geologic mapping and used as a proxy for paleontological sensitivity. The features of the proposed project were then laid out on the geological map, and the Project facilities that have the potential to cross units of varying paleontological sensitivity (high, moderate, unknown, low, or no sensitivity) were delineated.

Paleontological Inventory of the Primary Study Area

Guidelines for paleontological resources assessments (SVP, No Date) call for the inventory of all geological units within one mile of the ground-disturbing activities associated with any project (Appendix 16C) to ensure that both surficial geologic units and geologic units that would be encountered in the subsurface are adequately analyzed. These geological units are then evaluated for paleontological sensitivity. During the preparation of this chapter, several data gaps were identified that complicate characterization of the paleontological sensitivity of the Primary Study Area. These include the following:

- Geologic maps at the necessary level of detail for this analysis tend to group all pre-Tertiary formations into the same category.
- There are few published geological studies of the GVS and overlying Neogene and Quaternary sediments within the limits of the project.
- There are proportionately few paleontological studies of these same rocks.

Older rocks referred to as the GVS occur only on the western portion of the Primary Study Area in the foothills of the North Coast Ranges. In the Sacramento Valley, much younger Pliocene (approximately 5.3 to 2.6 MYA) and Quaternary (2.6 MYA to present) sediments are found.

The results of the search of paleontological site records are summarized in Table 16-6. A comprehensive list of sites recorded in Glenn and Colusa counties is provided in Appendix 16B. Although the Primary Study Area includes only the Project area plus a one-mile buffer, all localities were recorded for each formation because the paleontological sensitivity of a geologic unit is based on the abundance of fossils within the entire unit (though local variations in the rock are taken into account).

Table 16-6
Results of Paleontological Records Search by Geological Unit for the Primary Study Area

Formation, Member, or Unit Name[a]		Number of Localities on Record[a]	
		UCMP Database	Paleobiology Database
Great Valley Sequence rocks (marine sediments older than 65 million years)			
1	Boxer	2[b]	0
2	Antelope Shale	13	2
3	Fiske Creek	1[b]	0
4	Julian Rocks	0	0
5	Brophy Canyon	0	0
6	Cortina	0	0
7	Venado Sandstone	9	0
8	Yolo	3	0
9	Sites	5[b]	0
10	Funks	4	1
11	Rumsey	0	0
12	Guinda	16	0
13	Forbes	25	6
14	Dobbins Shale	1	0
15	Hoodoo Hills	0	0
Late Neogene and Quaternary Sediments (younger than approximately 5.7 million years)			
1	Tehama (sites in Colusa, Glenn, and Tehama Counties only)	6	0
2	Red Bluff	2[c]	0
3	Victor[d]	1	0
4	Riverbank	9	2
5	Modesto	5	0

[a]Includes names that are no longer in use, but which may still be attached to fossil collection records (Appendix 16C).
[b]Limited to microfossil collections.
[c]Collections from the early 20th Century may now be attributed to a different unit, most likely the Tehama Formation.
[d]Name superseded, but collections from the early 20th Century may still bear this designator.

Note:
UCMP = University of California Museum of Paleontology at Berkeley

Source: UCMP, n. d.; PaleoBiology Database, n.d. (Appendix 16B)

Many of the recorded paleontological localities in the GVS are microfossil samples (chiefly small plankton fossils, including foraminifera and diatoms). The use of microfossils in age dating, correlation, and in paleoenvironmental studies is well documented. However, rocks bearing only microfossils are not typically assigned high or even moderate levels of paleontological sensitivity because these fossils are very abundant and found in many different sedimentary units, and therefore are not scientifically significant as individuals. Also, although microfossils usually possess scientific significance as an assemblage, isolated specimens or samples of microfossils normally have little scientific use.

Cretaceous Marine Units

The databases consulted (UCMP, n.d.; PaleoBiology Database, n.d.) included references to paleontological sites in 10 of the 15 Cretaceous geological units comprising the GVS. Of these, three (the Boxer, Fiske, and Sites formations) are known to yield only microfossils (chiefly foraminifera and radiolaria). The remaining seven of the GVS units in the Primary Study Area yield scientifically significant megafossils.

The comparative lack of marine sedimentary units that have yielded megafossils is consistent with the inferred paleoenvironments represented by these units. They are deep-ocean sediments consisting of muds of the abyssal ocean floor and trench, and sandstones of deep submarine fans. The depth of water during deposition of the GVS has been calculated as greater than 13,000 feet (Ingersoll, 1979). At that depth, few animals can be expected to be incorporated into the paleontological record due to a combination of geochemical and ecological factors, including low probability of preservation due to both the low density of animals at abyssal depths (the deep sea floor), and the fact that seawater at such depths dissolves calcite shells. In considering the paucity of fossil record from the GVS, Haggart and Ward (1984) observed that many paleontologists have had difficulty correlating Cretaceous strata of the GVS due to the lack of large fossils. Therefore, most studies have relied on microfossils to determine the relative age and stratigraphic position of these units, and most records for the GVS in the databases consulted (UCMP, n.d.; PaleoBiology Database, n.d.) consist of these microfossil assemblages.

Changes in the species composition of microfossils that lived at shallow depths have been the principal means of assigning strata to different ages within the Cretaceous period. However, with more intensive collecting, Haggart and Ward (1984) demonstrated that megafossils, primarily mollusks, can be found in at least the Santonian and Campanian strata (85.8 to 70.6 MYA) on the west side of the Sacramento Valley. Some of these fossils have been instrumental in clarifying the timing of deposition of the upper portion of the GVS (Haggart and Ward, 1984). The paleontological records of the seven GVS units that yield megafossils are discussed in Table 16-7.

Table 16-7
Great Valley Sequence Units in the Primary Study Area that Yield Megafossils

Antelope Shale: The gastropod *Paosia* (*Trajanella) colusaensis* was recovered from rocks that are likely from either the Antelope Shale or the overlying Venado Sandstone (Squires, 2004). The specimens were from near the town of Sites and are donated specimens, so the exact locale for this collection is uncertain. The gastropods *Paosia californica* and *Turitella petersoni* are from the upper part of the Antelope Shale (Brown and Rich, 1961). Similar to the Venado Sandstone above it, many of the invertebrates are thought to be shallow water fauna redeposited in submarine deposits, which may compromise some of their scientific value because the original context or depositional setting of the specimens would be in doubt.
Venado Sandstone: Similar to the Antelope Shale, many of the invertebrates found in the Venado are thought to have been redeposited in submarine deposits. The UCMP database notes that the collections there include important specimens of the Cenomanian to early Turonian (99.6 to 89.3 MYA) bivalve *Yaadia leana*.

Table 16-7
Great Valley Sequence Units in the Primary Study Area that Yield Megafossils

Yolo Formation: The Turonian (93.5 to 89.3 MYA) Yolo Formation has yielded mollusks of the genus *Turridea* (Oqvist, n.d.) as well as an array of ammonites (Squires, 2004). Also present in this unit is the gastropod *Paosia californica* (Squires, 2004).
Funks Formation: The texanitid ammonites (a type of cephalopodl) are relatively rare in Cretaceous sediments of the Pacific Coast, and the Funks Formation is important because it has yielded more than two dozen specimens of *Protexanites thompsoni* (Jones, 1966), a member of this group. The type site is approximately one mile north of Putah Creek, well south of the current Primary Study Area.
Guinda Formation: The gastropod *Paosia californica* and the bivalve *Cucullaea melhaseana* have been recovered from this unit (Squires, 2004). The uppermost portions of this formation yield specimens of the index fossil *Bostrychoceras elongatum*, an ammonite (Haggart and Ward, 1984).
Dobbins Shale: The lower half of the Dobbins Shale contains the ammonite *Bostrychoceras elongatum*, establishing that the species' range continued into this unit from the underlying Guinda Formation. Uppermost portions of the Dobbins Shale contain abundant specimens of the pelecypod *Inoceramus schmidti*, a lower Campanian (83.5 to 70.6 MYA) index fossil (Haggart and Ward, 1984).
Forbes Formation: The transition between the Dobbins Shale and the overlying Forbes Formation contains the important ammonite *Baculites chicoensis*, which allows correlation of this unit of the GVS with the upper member of the Chico Formation on the east side of the Sacramento Valley (Haggart and Ward, 1984).

Pliocene and Quaternary Terrestrial Units

Tehama Formation

The diverse fossil assemblage from the Pliocene (5.3 to 2.6 MYA) Tehama Formation (including the outdated Victor and Red Bluff Formations [Appendix 16C]) documents conditions in California not long before the beginning of the environmental changes accompanying the Pleistocene (2.6 to 0.01 MYA) ice ages, and the animals living in those environments. Recent discovery of the remains of a giant tortoise (*Geochelone*) from the Tehama Formation near Red Bluff (Sierra College, 2007) adds to the list of animals from the Tehama Formation that already included several records of the giant tortoise, as well as *Pliomastodon* (mastodon); *Mammut* (mammoth); *Equus simplicidens, Pliohippus, and Nannippus* (horses); *Camelops hesternus* (North American camel); Megalonichidae and *Mealonyx* (ground sloth);*Platygonus* (a pig-like animal); *Canis* (dog); *Odocoileus* (a genus of deer); *Thomomys* (pocket gopher); *Neotoma* (wood or pack rat); *Peromyscus* (deer mice); *Reithrodontomys* (harvest mice); *Osteichtheyes* (fish); and the hyena-like dog *Borophagus diversidens*.

Riverbank Formation

A variety of Pleistocene age (2.6 to 0.01 MYA) fossils were identified in extensive gravel pit excavations in east Sacramento (Hansen and Begg, 1970). They report a variety of Rancholabrean fossils (from about 125,000 to 10,000 years B.P.) collected from two gravel quarries in the Riverbank Formation. These fossils include: *Archoplites* (sunfish), two bird species, *Bison antiquus* (bison), *Camelops hesternus* (camel), *Canis dirus* (dire wolf), *Canis latrans* (coyote), *Clemmys marmorata* (pond turtle), *Colubridae* (colubrid snake), *Cyprinidae* (carp), *Equus* (horse), *Mammuthus* (mammoth), *Microtus* (meadow mouse or vole), *Neotoma* (wood rat), *Odocoileus* (deer), *Paramylodon harlani* (ground sloth), *Perognathus* (pocket mouse), *Scapanus latimanus* (mole), *Spermophilus* cf. *S. beecheyi* (ground squirrel), *Sylvilagus* (rabbit), *Thomomys bottae* (pocket gopher), as well as remains of trees such as *Pseudotsuga* (Douglas fir), *Platanus* (sycamore), and *Salix* (willow)

A variety of fossils of extinct large mammals were collected by Hilton et al. (2000), including *Glossotherium harlani* and *Paramylodon harlani* (ground sloths), *Bison antiquus* (bison), *Equus* sp.

(horse), *Camelops hesternus* (camel), *Sciurus* sp. (squirrel), and *Mammuthus* sp. (mammoth), as well as plant fossils during the excavations for a large sports arena north of Sacramento. These fossils were found in excavations approximately 13 to 30 feet below the ground surface. These fossils were attributed to the Riverbank Formation.

Dundas and Cunningham (1993) also collected Pleistocene-age ground sloth (*Glossotherium harlani*) and Columbian mammoth (*Mammuthus columbi*) remains from the Riverbank Formation in the Extended Study Area.

Modesto Formation

Similar to the Riverbank Formation, the Modesto Formation is represented by a variety of deposits, mainly river deposits, but also terrestrial sediment such as dune fields and sand sheets. The fossil record of the Late Pleistocene Modesto Formation is, therefore, similar to the Riverbank Formation, although the taxa represented in the Modesto are generally from a more recent time period. The extinct North American camel is well represented in collections from the Modesto. Other vertebrates that have been recovered from the Modesto Formation include Jefferson's ground sloth (*Megalonyx*), mammoth (*Mammuthus*), and an extinct species of bison.

Sensitivity Criteria

The paleontological sensitivity of a rock unit is determined by the likelihood that it will yield identifiable, unique, or scientifically important fossils. Well-developed and documented fossil-bearing formations are less likely to yield a unique paleontological resource, but the resources may nevertheless retain scientific importance.

An individual fossil specimen may be considered unique or significant if it is (1) identifiable, (2) complete, (3) well preserved, (4) useful in determining the age of the formation, (5) useful in interpreting the ancient environment, (6) a member of a rare species, or (7) a skeletal element different from, or a specimen more complete than, those now available for its species. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as part of a research project).

The following tasks were completed to establish the paleontological sensitivity of each rock unit potentially exposed in the Primary Study Area:

- Designated certain unit names as not applicable (n/a) because they duplicate other names being used, or because they are otherwise no longer used by geologists
- Considered the scientific significance of the fossil finds from the unit
- Assessed the potential paleontological productivity of each rock unit exposed within one mile of the proposed project features, based on available documentation
- Considered the potential for a rock unit exposed at the project feature site to contain a unique paleontological resource

Paleontological Sensitivity of Sediments in the Primary Study Area

The paleontological sensitivity of any part of the Primary Study Area depends almost entirely on its geology. Table 16-8 presents a summary of the paleontological sensitivity for the rock units that may be affected by proposed project features in the Primary Study Area.

Table 16-8
Paleontological Sensitivity of the Rock Units Within One Mile of Any Proposed Primary Study Area Project Facility

Formation, Member, or Unit Name Attributed[a]		Sensitivity[b]	Remarks
Great Valley Sequence Rocks (Upper Cretaceous; Older than 65 Million Years)			
1	Boxer	low	-
2	Antelope Shale	moderate	-
3	Fiske Creek	low	Temporally equivalent with the Boxer formation
4	Julian Rocks	low	Temporally equivalent with the Boxer formation
5	Brophy Canyon	low	Temporally equivalent to the lower Boxer formation
6	Cortina	low	-
7	Venado Sandstone	moderate	-
8	Yolo	moderate	-
9	Sites	moderate	-
10	Funks	moderate	-
11	Rumsey[c]	moderate	-
12	Guinda[c]	moderate	-
13	Forbes[c]	moderate	-
14	Dobbins Shale[a]	moderate	-
15	Hoodoo Hills[a]	n/a	Name no longer in use
Pliocene and Quaternary Sediments (Younger than Approximately 5.7 Million Years)			
1	Tehama	high	-
2	Red Bluff	low	-
3	Victor	n/a	Name no longer in use
4	Riverbank	moderate	Surficial sediments affected by soil development are not paleontologically sensitive; most fossil sites are from near the Sacramento River or its major tributaries
5	Modesto	moderate	Surficial sediments affected by soil development are not paleontologically sensitive. Includes unnamed Pleistocene units; most fossil sites are from near the Sacramento River or its major tributaries

[a]Some of these names are outdated and no longer in use, but nevertheless fossil localities are recorded as occurring within them. Databases are not updated when the geological nomenclature is revised.

[b]Sensitivity ratings were assigned based on the guidelines outlined by the SVP (n.d.), and by *Instructional Memorandum 2008-009* (USDI BLM, 2008). They are:

- High: A geologic unit known to be paleontologically productive and to contain fossil assemblages that include scientifically important species.
- Moderate: A geologic unit that is known to yield scientifically significant fossil specimens, but may not be paleontologically productive in any given area.
- Low: A geologic unit that is known to yield few identifiable fossils.

[c]These units do not outcrop within the Primary Study Area; however, they were included in this analysis because they may be encountered in the subsurface and, given the nature of the nomenclature of the Great Valley Sequence, to ensure all fossils within the Primary Study Area have been adequately analyzed.

The paleontological record of the GVS consists largely of microfossils. None of the GVS units are known to have an abundance of paleontological resources because they were deposited in a deep ocean setting; however, rare macrofossils such as bivalves, ammonites, and gastropods have been found in these units.

Although uncommon in the GVS, these fossils are important for dating the geologic units they are found in and for comparing geologic units throughout the Great Basin. The Venado, Yolo, Sites, Funks, Rumsey, Guinda, and Forbes formations, and the Dobbins shale, are considered to have a “moderate” paleontological sensitivity rating (Table 16-8). If large fossils, including invertebrate fossils, are encountered during Project construction, they would likely be scientifically significant.

Neither the Modesto nor the Riverbank formations within the Primary Study Area are assigned “high” paleontological sensitivity. These formations have yielded important fossils; however, the recorded paleontological sites are located primarily near the Sacramento River and along its major tributaries. The paleontological productivity of the geologic units deposited at higher elevations in the Primary Study Area does not appear to be substantial. Therefore, the paleontological sensitivity of the Modesto and Riverbank formations is considered “moderate.”

16.3 Environmental Impacts/Environmental Consequences

16.3.1 Regulatory Setting

Geology, minerals, soils, and paleontological resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

16.1.1.1 Federal Plans, Policies, and Regulations

- Clean Water Act Section 402, National Pollutant Discharge Elimination System Program
- National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Sites
- Antiquities Act of 1906
- Archaeological Resources Protection Act of 1979
- Omnibus Public Land Management Act of 2009

16.1.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act, *Guidelines for the Implementation of CEQA* (Public Resources Code Section 15023, Appendix G)
- Porter-Cologne Water Quality Control Act
- California Department of Fish and Game Code 1602
- California Water Code, Division 3: Dams and Reservoirs
- Surface Mining and Reclamation Act of 1975
- Seismic Hazards Mapping Act of 1990
- Asbestos Airborne Toxic Control Measure for Surfacing Applications (amended 2000)
- Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations

- Regulatory Design Codes for Buildings, Highways, and Other Structures
- Nonpoint Source Implementation and Enforcement Policy
- *California Public Resources Code* Chapter 1.7 Archaeological, Paleontological, and Historical Sites Section 5097.5

16.1.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

16.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for geology, minerals, soils, and paleontological resources:

Would the Project:

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?
- Result in substantial soil erosion or the loss of topsoil?
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local General Plan, Specific Plan, or other land use plan?
- Expose people (working on the Project or the public) during Project construction or operation to naturally occurring asbestos?
- Directly or indirectly destroy of a unique paleontological resource or site or unique geologic feature?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Effects on a geologic unit or soil unit from Project construction, operation, and maintenance.
- Project construction, operation, and maintenance effects on soil erosion and loss of topsoil.
- Risks to life and property from Project construction, operation, and maintenance on expansive soil.

- Project construction, operation, and maintenance effects on soils that are incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the wastewater disposal.
- Loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- Loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.
- Expose people to naturally occurring asbestos during Project construction, operation, or maintenance
- Project construction, operation, and maintenance effects on paleontological resources.

Paleontological resources impacts would include damage or destruction of a scientifically significant fossil, the removal of a scientifically significant fossil from its stratigraphic context, or any other action that reduces the amount of information available to future researchers. The probability that excavations would cause such impacts is proportional to the paleontological sensitivity of the geologic units. Excavations within high-sensitivity geologic units have a high potential to adversely impact paleontological resources. Excavations within moderate-sensitivity sediments have a lower potential to adversely impact paleontological resources, and that potential is frequently limited to specific portions of the unit. Low-sensitivity sedimentary units have a very low, but non-zero, chance of impacting paleontological resources. Excavations that do not impact paleontological resources—or that only impact non-significant fossils, such as microfossils—are not considered to impact paleontological resources. Impacts to sediment of moderate to high paleontological sensitivity, or to scientifically important fossils, would constitute significant impacts in the absence of mitigation.

16.3.3 Impact Assessment Assumptions and Methodology

16.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to geologic, mineral, soil, and paleontological resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect

effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.
- Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways. At the Project facility sites, areas that are susceptible to erosion are those that would be exposed during the construction phase and along the reservoir shoreline where soil is subjected to wave action. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection. However, some runoff and soil erosion may occur at discharge points from covered areas.
- Effects to paleontological resources would only occur during disturbance of fossil-bearing geologic units, which are typically associated with the construction phase of any project. No impacts would occur during Project operation activities or maintenance of Project facilities because no excavations within fossil-bearing geologic units would occur in association with operations or maintenance activities. Maintenance for several of the Project components would include dredging of built-up sediment, but such excavation activities would not affect paleontologically sensitive sediment. Paleontological resources are considered to be affected only if they are removed from the sediment or otherwise mechanically damaged, which would only occur during excavations during the Project construction phase.

16.3.3.2 Methodology

A combination of data, published reports, and professional experience with initial investigations for the proposed Project was used to evaluate the Project alternatives for potential impacts due to geology, soils, and minerals. The Extended and Secondary study area impact assessments primarily relied on data and publications (both printed and web-based) from the California Geological Survey and the United States Geological Survey. Professional experience with initial investigations included geological mapping within the Primary Study Area and core-drilling at the proposed damsites.

Expansive soils are characterized by a shrink-swell characteristic[12]. Expansive soils are largely comprised of clays, which expand in volume when water is absorbed and shrink when dried. Soil materials at the Project facility sites are composed of a wide variety of soil types. Using the NRCS Soil Data Viewer, the shrink-swell potential was derived for all of the soil types present at Project facility sites.

The Society of Vertebrate Paleontology Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources (SVP, 2010) provide guidelines that establish standard methods for assessing potential impacts to fossils and mitigating these impacts. For the paleontological resources impacts assessment, the paleontological sensitivity and distribution of rock units (including unconsolidated sediments), established during the analysis of the existing environment (refer to Appendix 16C), within the impacts area was considered, as well as the type of excavation or other

[12] "Shrink-swell" is the cyclical expansion and contraction that occurs in fine-grained clay sediments from wetting and drying. Structures located on soils with this characteristic may be damaged over a long period of time, usually as the result of inadequate foundation engineering or the placement of structures directly on expansive soils.

subsurface disturbance. The features of the Project were laid out on a map showing the distribution of rocks having varying paleontological sensitivity. Impacts were identified for those Project facilities that have the potential to cross units of varying paleontological sensitivity (high, moderate, unknown, low, or no sensitivity).

16.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above for geology, soils, or minerals were eliminated from further consideration in this chapter.

Within the Primary Study Area, operation and maintenance activities associated with Project facilities would not require excavations; the impacts of these activities are, therefore, not discussed for paleontological resources.

16.3.5 Impacts Associated with the No Project/No Action Alternative

16.3.5.1 Geology and Soils

<u>Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative</u>

Construction, Operation, and Maintenance Impacts

Agricultural Water Use; Municipal and Industrial Water Use; Wildlife Refuge Water Use; and San Luis Reservoir; Trinity Lake; Lewiston Lake; Trinity River; Klamath River downstream of the Trinity River; Whiskeytown Lake; Spring Creek; Shasta Lake; Sacramento River; Keswick Reservoir; Clear Creek; Lake Oroville; Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to geology and soils have been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger human population would require additional development to occur, which could affect, and/or be affected by, local geology and soils. These impacts that would occur as a result of the population growth and development would be managed at the local level (e.g., cities and counties) in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

It is possible that one or more of the projects that are included in the No Project/No Action Alternative could affect or be affected by existing site-specific geologic and/or soils[13] conditions. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would

[13] Potential impacts relating to geology or soils can be a combination of the two resources. Therefore, geology impacts and soils impacts have been combined as "Geo/Soils" impacts.

be required to mitigate for significant impacts. In addition, the Project would not be constructed if this alternative is implemented. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Refer to the **Impact Geo/Soils-1** discussion. That discussion is also applicable to effects on soil erosion and loss of topsoil.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Refer to the **Impact Geo/Soils-1** discussion. That discussion is also applicable to expansive soils.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

Refer to the **Impact Geo/Soils-1** discussion. It is possible that one or more of the projects that are included in the No Project/No Action Alternative would include septic tanks or alternative wastewater disposal systems sited on soils that are incapable of supporting such systems. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. In addition, the Project would not be constructed if the No Project/No Action Alternative is implemented. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

16.3.5.2 Minerals

Extended and Secondary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Min-1: Loss of Availability of a Known Mineral Resource that would be of Value to the Region and the Residents of the State

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Extended and Secondary study areas. If the No Project/No Action Alternative is implemented, mineral resources would continue to be excavated, stockpiled, imported, or exported, and projected population growth could increase the rate of use of these resources. However, County General Plans and other regulations identify local mineral resources and specify measures to protect those resources from depletion. In addition, the Project would not be constructed if this alternative is implemented. Therefore, implementation of the No Project/No Action

Alternative **would not have a substantial adverse effect** on mineral resources in the Extended and Secondary study areas, when compared to Existing Conditions.

Impact Min-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

Refer to the **Impact Min-1** discussion as it relates to the Extended and Secondary study areas. That discussion is also applicable to mineral resource recovery sites.

Impact Min-3: Expose People to Naturally Occurring Asbestos during Project Construction, Operation, or Maintenance

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Extended and Secondary study areas. Ultramafic rocks (which when converted to the metamorphic rock, serpentinite, can contain asbestos), occur in certain areas within the Extended and Secondary study areas. It is possible that one or more projects included in the No Project/No Action Alternative could mine, expose, or use serpentinite and cause naturally occurring asbestos to become airborne. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. In addition, the Project would not be constructed if this alternative is implemented. Therefore, **there would not be a substantial adverse effect** from the airborne emission of naturally occurring asbestos in the Extended and Secondary study areas, when compared to Existing Conditions.

Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Min-1: Loss of Availability of a Known Mineral Resource that would be of Value to the Region and the Residents of the State

According to the Land Use Element of the Colusa County General Plan and Aggregate Resource Management Plan for Glenn County, identified mineral resource areas are located outside of the Primary Study Area. Therefore, continued land use activities, as well as projected population growth, within the counties of the Primary Study Area would not affect mineral resources. In addition, the projects included in the No Project/No Action Alternative do not occur within the Primary Study Area, and the Project would not be constructed if this alternative is implemented. Implementation of the No Project/No Action Alternative would not result in the loss of availability of any known mineral resource, or interfere with any existing commercial mining activity and therefore **would not have a substantial adverse effect** on mineral resources, when compared to Existing Conditions.

Impact Min-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

Refer to the **Impact Min-1** discussion. That discussion is also applicable to mineral resource recovery sites.

Impact Min-3: Expose People to Naturally Occurring Asbestos during Project Construction, Operation, or Maintenance

Rocks containing naturally occurring asbestos are not present in the Primary Study Area, nor are they present in the watershed draining into the Primary Study Area. Therefore, continued land use activities, as well as projected population growth, within the counties of the Primary Study Area would not expose people to naturally occurring asbestos in these counties. In addition, the projects included in the No

Project/No Action Alternative do not occur within the Primary Study Area, and the Project would not be constructed if this alternative is implemented. Implementation of the No Project/No Action Alternative would not expose people in Glenn and Colusa counties to naturally occurring asbestos, and therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

16.3.5.3 Paleontology

Extended and Secondary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Extended and Secondary study areas. It is possible that projects within the Secondary and Extended study areas that are included in the No Project/No Action Alternative would affect paleontological resources. However, any project considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for paleontological resource impacts. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The projects included in the No Project/No Action Alternative do not occur within the Primary Study Area, and the Project would not be constructed if this alternative is implemented. Therefore, **there would not be a substantial adverse effect** to paleontological resources, when compared to Existing Conditions.

16.3.6 Impacts Associated with Alternative A

16.3.6.1 Geology and Soils

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Because there would be no direct Project-related construction or maintenance activities occurring in the Extended Study Area, there would be no increase in the risk of geologic or soils hazards to people or structures in the Extended Study Area, when compared to Existing Conditions or the No Project/No Action Alternative. Operation of the Project would result increased water level fluctuations at the San Luis Reservoir and increased reliability of water to agricultural, municipal and industrial water users, and an alternate supply to wildlife refuge users; these water delivery operations would not affect geology or soils. Alternative A would result in **no impact** to geology or soils or in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Extended Study Area. That discussion is also applicable to effects on soil erosion and loss of topsoil.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Extended Study Area. San Luis Reservoir currently experiences water level fluctuations; changing those would not affect the soils underlying the reservoir. Increased water reliability to agricultural, municipal and industrial water users, and an alternate supply to wildlife refuge users in the Extended Study Area would not affect underlying soils. Therefore, there would be **no impact** to geology or soils, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

The Project does not include a septic tank, alternative wastewater disposal system, or sewer system that would be constructed, operated, or maintained in the Extended Study Area; therefore, there would be **no impact** to geology or soils, when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant. Direct Project-related operational activities in the Secondary Study Area include the larger reservoirs having more stable water levels (i.e., would not fluctuate as widely) and altered discharge flows in downstream waterways. The only direct Project-related maintenance activity that would occur is the removal of sediment from the existing canal intakes. Because these Project-related activities in the Secondary Study Area are not expected to result in an increase in geologic or soils hazards to people or structures, when compared to Existing Conditions or the No Project/No Action Alternative, **no impact** to geology or soils is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Secondary Study Area. That discussion is also applicable to effects on soil erosion and loss of topsoil.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Refer to the **Impact Geo/Soils-1** discussion as it relates to the Secondary Study Area. The Red Bluff Pumping Plant is located on soils that have a low shrink/swell capacity. Therefore, **no impact** to geology or soils is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

The Project does not include a septic tank, alternative wastewater disposal system, or sewer system that would be constructed, operated, or maintained in the Secondary Study Area; therefore, there would be **no impact** to geology or soils, when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area (1.27 MAF)

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

The fundamental geology and soils in the Primary Study Area would remain unchanged with construction, operation, and maintenance of all of the Project facilities, when compared to Existing Conditions or the No Project/No Action Alternative; therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

During the construction phase, clearing and grubbing activities would occur. Demolition of existing structures and removal of asphalt and fencing would also occur. In addition, temporary access roads would be constructed within the reservoir footprint. These activities would result in an increase of soil erosion within the reservoir footprint. Construction phase soil erosion is expected to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, reservoir water surface elevations would fluctuate between a minimum of 340 feet and 480 feet. Shoreline erosion would occur along the zone of reservoir water elevation fluctuation. Sediment delivery into the reservoir resulting from shoreline erosion would be retained within the reservoir and not discharged. Shoreline soil erosion is expected to be **potentially significant**.

Maintenance activities, including garbage removal and maintenance of signs and buoys, would not be expected to result in increased soil erosion. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

No structures would be constructed within the proposed reservoir inundation area, except for the Sites Reservoir Inlet/Outlet Structure, which is addressed separately. Therefore, construction, operation, and maintenance of the reservoir would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No septic tanks or alternative wastewater disposal systems would be constructed within the Sites Reservoir Inundation Area. Therefore, construction, operation, and maintenance of the reservoir would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Reservoir Dams

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to Sites Reservoir Dams.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the dams would require the excavation, transport, stockpiling, grading, drilling, blasting, and use of a substantial quantity of bedrock, alluvium, and soil obtained from the borrow areas, and the installation of support structures. Equipment and vehicle staging areas would also be required. Construction activities with the potential for sediment delivery to Funks Creek and Stone Corral Creek include fill placement on the downstream face, and the fill stockpiles downstream of the dam. The soils disturbed by Project earthwork and construction activities, as well as stockpiled materials for use in the construction, would be susceptible to water-induced erosion and loss of topsoil. Construction phase soil erosion is anticipated to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation and maintenance, no soils would erode because the soils would have been replaced with the dam structures. The dams would be faced with rip-rap protection on the reservoir side and vegetation on the landward side. Soil erosion is anticipated to be minimal, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Construction of the dams and saddle dams involves excavating all soils down to firm bedrock. Complete excavation of all soils would remove the expansion potential. Therefore, there would be **no impact** related to Project construction, operation, or maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No septic tanks or alternative wastewater disposal systems would be constructed within the damsites. Therefore, construction, operation, and maintenance of the dams would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Recreation Areas.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the Recreation Areas would require grading, including removal and/or stockpiling of surface soils and some bedrock. Construction phase soil erosion is anticipated to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative. During operation, increased runoff from impervious surfaces developed at the recreation areas could increase erosion in local drainages, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Maintenance activities, including road grading, vegetation control, and fuels management, could also increase erosion in local drainages, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Approximately 66 percent (802 acres) of the total area of the proposed Recreation Areas is classified by the NRCS as having a high shrink-swell potential. Impacts from constructing, operating, and maintaining Project facilities within the Recreation Areas on expansive soils are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

The Recreation Areas would have vault toilets, and waste would be transported and disposed of outside of the Primary Study Area. Vault toilets are not considered to be alternative wastewater disposal systems. Therefore, construction, operation, and maintenance would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Road Relocations and South Bridge.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Construction of the Road Relocations and South Bridge would require grading and cut/fill operations along the roads' footprints and 200-foot construction disturbance area. Slopes may be steepened, leading to increased erosion potential. Construction phase soil erosion is anticipated to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, increased runoff from impervious road surfaces could increase erosion in local drainages, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. This potential increase in runoff would require maintenance activities designed to reduce the impacts of the associated erosion.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

More than 50 percent (679 acres) of the total area of the Road Relocations and South Bridge are classified by the NRCS as having a high shrink-swell potential. An additional 125 acres are classified as having a low to high or moderate to high shrink-swell potential. Impacts from constructing, operating, and maintaining the roads and South Bridge on expansive soils are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No septic tanks or alternative wastewater disposal systems would be constructed, operated, or maintained within the road relocations. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from the Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure, and Sites Reservoir Inlet/Outlet Structure

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from the Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure, and Sites Reservoir Inlet/Outlet Structure.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Construction of these Project facilities would require the excavation, transport, stockpiling, grading, drilling, blasting. Tunnel construction would require stockpiling of rock spoil removed from the tunnel alignment. Slopes may be steepened leading to increased runoff potential. Construction phase soil erosion is anticipated to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative. During Project operation and maintenance, areas would be covered with impervious material or vegetation; additional erosion is anticipated to be minimal, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Approximately 25 percent (24 acres) of the total area of these combined Project facilities is classified by the NRCS as having a high shrink-swell potential. Impacts from Project construction, operation, and maintenance are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No Project-related septic tanks or alternative wastewater disposal systems would be constructed, operated, or maintained at these facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Field Office Maintenance Yard

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Field Office Maintenance Yard.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the Field Office Maintenance Yard would require removal of topsoil and possibly some bedrock. Increased erosion may occur during construction, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. During Project operation and maintenance, areas would be covered with impervious material or vegetation; additional erosion is anticipated to be minimal, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

Less than two percent (0.3 acre) of the total area of the Field Office Maintenance Yard is classified by the NRCS as having a high shrink-swell potential. Project construction, operation, and maintenance impacts are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

It is anticipated that a septic tank would be located in the vicinity of the Field Office Maintenance Yard. Soils in the vicinity of this Project feature are considered to have "limitations". Impacts are, therefore, considered **potentially significant** for construction, operation, and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Holthouse Reservoir Complex and the Holthouse Reservoir Electrical Switchyard.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

During the dredging of Funks Reservoir, Funks Reservoir would be de-watered. Draining and maintenance of the reservoir could lead to increased erosion of exposed reservoir sediments, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Construction of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would require the excavation, transport, stockpiling, grading, drilling, blasting, and use of a moderate quantity of bedrock, alluvium, and soil obtained from the borrow areas. Equipment and vehicle staging areas would also be required. Construction activities with the potential for sediment delivery to Funks Creek include fill placement on the downstream face and the fill stockpiles downstream of the dam. The soils disturbed by Project earthwork and construction activities, as well as stockpiled materials for use in the construction, would be susceptible to water induced erosion and loss of topsoil, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, reservoir water surface elevations would fluctuate up to 14 feet. Shoreline erosion would occur along the zone of reservoir-elevation fluctuation. Sediment delivery into the reservoir resulting from shoreline erosion would be retained within the reservoir and not discharged. Shoreline soil erosion is anticipated to be **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Periodic maintenance required for the existing Funks Reservoir includes road, vegetation, and fence maintenance, as well as debris removal, on an as-needed basis. The reservoir is currently also drained annually. These maintenance activities are expected to be the same for Holthouse Reservoir. These maintenance activities around the larger reservoir complex could increase erosion in local drainages, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

The existing Funks Reservoir is filled with water; no NRCS soil data is available. To be conservative, construction, operation, and maintenance impacts are considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Nearly 90 percent (324 acres) of the total area of the Holthouse Reservoir Complex, including the footprint of the Holthouse Reservoir Electrical Switchyard, is classified by the NRCS as having a high shrink-swell potential. Project construction, operation, and maintenance impacts are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No septic tanks or alternative wastewater disposal systems would be constructed, operated, or maintained within the Holthouse Reservoir Complex or at the Holthouse Reservoir Electrical Switchyard. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, and Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, and the GCID Canal Facilities Modifications.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, as well as the proposed modifications to existing GCID Canal Facilities, would require the excavation, transport, stockpiling, grading, and use of a moderate quantity of bedrock, alluvium, and soil obtained from the borrow areas. Increased erosion may occur during Project construction, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. During Project operation and maintenance, areas would be covered with impervious material or vegetation; additional erosion is anticipated to be minimal, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

All soils at these facilities are classified by the NRCS as having a high shrink-swell potential. Project construction, operation, and maintenance impacts are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

The TRR Pumping/ Generating Plant would have portable toilets, and waste would be transported and disposed of outside of the Primary Study Area. Portable toilets are not considered to be alternative wastewater disposal systems. Therefore, construction, operation, and maintenance would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Transmission Line.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the Delevan Transmission Line would require the construction of a temporary access road along the alignment and soil excavation for tower footings. During Project construction, erosion is anticipated to occur, resulting in a **potentially significant impact.** Project operation would be an unmanned activity. Maintenance activities, including equipment inspections and vegetation maintenance, are expected to cause minimal soil erosion. Therefore, operation and maintenance would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

The Delevan Transmission Line alignment traverses soils that are classified by the NRCS as having a high shrink-swell potential. Project construction, operation, and maintenance impacts are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No Project-related septic tanks or alternative wastewater disposal systems would be constructed, operated, or maintained along the Delevan Transmission Line. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, and the Delevan Pipeline Electrical Switchyard.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Construction of the Delevan Pipeline and TRR Pipeline would require dewatering, as well as trenching of soils and alluvial material down to the design depth. The excess materials could be distributed on a 750-foot-wide strip on either side of the pipelines' alignment. Construction of the TRR Pipeline Road and Delevan Pipeline Electrical Switchyard would also result in ground disturbance. However, during the construction period additional erosion is anticipated to be minimal because the terrain is flat and generally surrounded by rice checks, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, because the pipelines would be buried and operated remotely, no additional erosion impacts are anticipated, resulting in **no impact**, when compared to Existing Conditions or the No Project/No Action Alternative. Periodic maintenance inspections would not cause additional erosion impacts, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation and maintenance of the Delevan Pipeline Electrical Switchyard, areas would be covered with a gravel base; additional erosion is anticipated to be minimal, resulting in a *less-than-significant impact****, when compared to Existing Conditions or the No Project/No Action Alternative.***

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

More than 80 percent (176 acres) of the total area of these Project features is classified by the NRCS as having a high shrink-swell potential. Project construction, operation, and maintenance impacts of the Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard are, therefore, considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No Project-related septic tanks or alternative wastewater disposal systems would be constructed, operated, or maintained along the Delevan Pipeline, TRR Pipeline, or TRR Pipeline Road, or at the Delevan Pipeline Electrical Switchyard. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Pipeline Intake Facilities.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The construction of the Delevan Pipeline Intake Facilities would require dewatering; clearing and grading the construction workspace; excavating soils and alluvium from the forebay, afterbay, and pumping plant sites; and filling and re-grading where needed. During the construction period, additional erosion is anticipated, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. During Project operation and maintenance, areas would be covered with impervious material or vegetation; no additional erosion impacts are anticipated, resulting in **no impact**, when compared to Existing Conditions or the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

All soil at this Project feature location is classified by the NRCS as having a low shrink-swell potential. Construction, operation, and maintenance impacts are, therefore, considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

The Delevan Pipeline Intake Facilities would have portable toilets, and waste would be transported and disposed of outside of the Primary Study Area. Portable toilets are not considered to be alternative wastewater disposal systems. Therefore, construction, operation, and maintenance would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact Geo/Soils-1: Effects on a Geologic Unit or Soil Unit from Project Construction, Operation, and Maintenance

Refer to the **Impact Geo/Soils-1** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Project Buffer.

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

During Project construction, existing structures within the Project Buffer would be demolished and fences would be constructed, which may cause a temporary increase in soil erosion. Project construction, operation, and maintenance impacts are considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

The construction and operation of a fuelbreak around the entire perimeter of the Project Buffer, as well as maintenance of the fuelbreak, would cause increases in soil erosion, resulting in a **potentially significant impact**, when compared to Existing Conditions or the No Project/No Action Alternative.

Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil

No structures would be constructed within the Project Buffer. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

No Project-related septic tanks or alternative wastewater disposal systems would be constructed within the Project Buffer. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

16.3.6.2 Minerals

Extended and Secondary Study Areas – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Min-1: Loss of Availability of a Known Mineral Resource that would be of Value to the Region and the Residents of the State

Aggregate minerals resources of the Stony Creek Fan (Glenn County) would be used for the NODOS Project. The Stony Creek Fan has an estimated material availability of 160 million cubic yards (DWR, 2002). Approximately 2,136,000 cubic yards of gravel would be imported from the Stony Creek Fan, located north of Willows (in the Secondary Study Area), to construct the Project (approximately 0.29 percent of the available resource). No mineral resources are required to operate and maintain the Project. Alternative A would, therefore, result in a **less-than-significant impact** on mineral resources in the Extended and Secondary study areas, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation (including operation of San Luis Reservoir) would not require mineral resources, resulting in **no impact** on mineral resources. In addition, the pump installation, operation, and maintenance at the Red Bluff Pumping Plant would not require mineral resources, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Min-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

Refer to the **Impact Min-1** discussion. That discussion is also applicable to locally important mineral resource recovery sites.

Impact Min-3: Expose People to Naturally Occurring Asbestos during Project Construction, Operation, or Maintenance

Ultramafic rocks containing naturally occurring asbestos would not be disturbed during Project construction, operation, or maintenance within the Extended and Secondary study areas. Therefore Alternative A would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Min-1: Loss of Availability of a Known Mineral Resource that would be of Value to the Region and the Residents of the State

Mineral resource areas are located outside of the Primary Study Area (Glenn County, 1997 and Colusa County, 1989). Approximately 2,136,000 cubic yards of gravel would be imported from the Stony Creek Fan, located north of Willows (in the Secondary Study Area), to construct the Project (approximately 0.29 percent of the available resource). No mineral resources are required to operate or maintain the Project. Therefore, construction, operation, and maintenance of Alternative A would not result in the loss of availability of any known mineral resource, or interfere with any existing commercial mining activity, resulting in **less-than-significant impact** on mineral resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Min-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

Refer to the **Impact Min-1** discussion. That discussion is also applicable to mineral resource recovery sites.

Impact Min-3: Expose People to Naturally Occurring Asbestos during Project Construction, Operation, or Maintenance

Rocks containing naturally occurring asbestos are not present in the Primary Study Area, nor are they present in the watershed draining into the Primary Study Area. Therefore, construction, operation, and maintenance activities associated with Alternative A would not expose people to naturally occurring asbestos, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

16.3.6.3 Paleontology

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Because there would be no direct Project-related construction or maintenance occurring in the Extended Study Area, no paleontologically sensitive sediments would be disturbed. Therefore, there would be **no impact** to paleontological resources in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant. The only direct Project-related maintenance activity that would occur would be the removal of sediment from the existing canal intakes. Because neither of these Project-related activities in the Secondary Study Area is expected to affect paleontologically sensitive sediment, **no impact** to paleontological resources is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area (1.27 MAF)

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Inundation would not affect paleontological resources; however, excavations (borrow pits and other similar facilities) may occur within the reservoir inundation area. Thus, construction of the 1.27-MAF reservoir would affect rocks of the GVS, including the low sensitivity Boxer Formation and, to a lesser extent, the low to moderate sensitivity Cortina Formation, as well as low sensitivity Quaternary alluvium predominantly located within stream channels. Excavation within the potentially fossiliferous sediments of the GVS within the reservoir footprint would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Reservoir Dams

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Construction of the footings and anchor walls for Golden Gate Dam and Sites Dam would involve deep excavation into potentially fossiliferous sediments of the GVS. The construction of Golden Gate and Sites dams would predominantly affect the moderate sensitivity Venado Sandstone of the Cortina Formation, and to a lesser extent the low sensitivity Boxer Formation. In addition, the seven saddle dams on the rim of the 1.27-MAF reservoir would affect the Boxer Formation and overlying low sensitivity basin fill. Because these saddle dam excavations would be shallower and of more limited extent than for Golden Gate and Sites dams, the impacts from construction of the saddle dams would be less than those associated with the larger Sites and Golden Gate dams. The deep excavation into potentially fossiliferous members of the GVS, as well as construction activities within other moderately sensitive rock units associated with dam construction, would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The recreation areas would be constructed predominantly on the rim of the Sites Reservoir inundation area, and would affect the low sensitivity Boxer Formation, the low- to moderate-sensitivity Cortina Formation, and low sensitivity Quaternary alluvium. Construction of the Antelope Island Recreation Area, which would be located within the reservoir, would only impact the Boxer Formation and basin fill (for this analysis, it is considered the same as Quaternary alluvium). Recreation Area construction activities within the potentially fossiliferous member of the GVS would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Similar to the recreation areas, the road relocations would occur predominantly on the rim of and within the inundation area, and in the case of the South Bridge, within the inundation area. Construction associated with these features would affect the low sensitivity Boxer Formation, the low- to moderate-sensitivity Cortina Formation, and low sensitivity Quaternary alluvium. Road construction activities within the potentially fossiliferous member of the GVS would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant and Sites Electrical Switchyard

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The Sites Pumping/Generating Plant and its associated switchyard would be located on the eastern margin of the Sites Reservoir, immediately south of the Golden Gate Dam. Project construction would affect the low- to moderate-sensitivity Cortina Formation and a thin veneer of low sensitivity Quaternary alluvium. Construction activities within the potentially fossiliferous member of the GVS associated with construction of these facilities would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

This tunnel would extend through the low sensitivity Boxer Formation to the west and the low- to moderate-sensitivity Cortina Formation to the east. Low sensitivity Quaternary alluvium would be impacted at both ends of the tunnel. Construction activities within the potentially fossiliferous member of the GVS associated with construction of the tunnel would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Reservoir Inlet/Outlet Structure

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The Sites Reservoir Inlet/Outlet Structure would affect the low sensitivity Boxer Formation and low sensitivity Quaternary alluvium within the inundation area, and would affect the low- to moderate-sensitivity Cortina Formation and low sensitivity basin fill east of the inundation area. Construction activities within the potentially fossiliferous member of the GVS associated with construction of the Inlet/Outlet Structure would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Field Office Maintenance Yard

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The Field Office Maintenance Yard would affect the low- to moderate-sensitivity Cortina Formation and low sensitivity basin fill, resulting in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Funks Reservoir is located east of the Sites Reservoir, on low sensitivity basin deposits underlain by the moderate sensitivity Sites and Yolo members of the Cortina Formation. Dredging is not likely to affect these formations because most reservoirs build up a layer of sediment over time and dredging would be directed at removing that recent accumulation of sediment. Because it is recent, sediment dredging would have **no impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would be located adjacent to the existing Funks Reservoir, within the Sacramento Valley. Similar to that described for Sites Reservoir, the inundation of Holthouse Reservoir would not impact paleontological resources, but excavations within the inundation area and excavations associated with the dam construction and the electrical switchyard would impact paleontologically sensitive geologic units. Construction of these features would affect low sensitivity basin fill and, at depth, the moderate sensitivity Riverbank Formation. Excavation and other construction activities associated with the Holthouse Reservoir Complex within the moderate sensitivity Riverbank Formation would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The majority of the construction associated with the existing GCID Canal consists of repairs or refurbishments, and would only affect previously disturbed sediment, which has a low paleontological sensitivity. Any excavations that extend beyond previously disturbed soil would affect the moderate sensitivity Modesto and Riverbank formations. Due to the possibility of disturbance to moderate sensitivity formations, construction activities associated with modifications to the GCID Canal would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Similar to the discussion for Sites and Holthouse reservoirs, the inundation of the TRR would not affect paleontological resources. However, excavation within the inundation area may occur, and excavations for dams and other structures around the rim of the inundation area would affect paleontologically sensitive units. The TRR would be located within the Sacramento Valley, and excavations associated with this reservoir would impact the moderate sensitivity Riverbank Formation and low sensitivity basin fill.

Construction associated with the connection to the GCID Canal would include the excavation of a canal energy dissipation bay with check structure, the inlet channel to the TRR, and the inlet control structure. These excavations would impact the moderate sensitivity Riverbank Formation and low sensitivity basin fill. Construction activities associated with these facilities within moderate sensitivity formations would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir Pumping/Generating Plant and Terminal Regulating Reservoir Electrical Switchyard

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Excavations associated with this pumping/generating plant and electrical switchyard, which would be located at the rim of the TRR, would impact the moderate sensitivity Riverbank Formation and low sensitivity basin fill. Construction activities associated with these facilities within a moderate sensitivity formation would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Construction of the TRR Pipeline, TRR Pipeline Road, and Delevan Pipeline Electrical Switchyard, which would be located between Holthouse Reservoir and the TRR, would affect the low- to moderate-sensitivity Cortina Formation and low-sensitivity basin fill. Construction activities within the potentially fossiliferous member of the GVS associated with construction of the TRR Pipeline, TRR Pipeline Road, and Delevan

Pipeline Electrical Switchyard would result in a **potentially significant impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The Delevan Transmission Line would affect the low- to moderate-sensitivity Cortina Formation and low sensitivity basin fill between the Sites Pumping/Generating Plant and the existing WAPA or PG&E transmission line, and low sensitivity Quaternary alluvium and basin deposits, the moderate sensitivity Modesto Formation, the moderate sensitivity Riverbank Formation, and the low- to moderate-sensitivity Cortina Formation between the existing WAPA or PG&E transmission line and the Sacramento River. Construction activities associated with placement of the transmission line tower footings within the potentially fossiliferous member of the GVS, or within moderate sensitivity formations, would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The Delevan Pipeline would parallel the Delevan Transmission Line, and along its entire length would affect the same geologic units: low sensitivity Quaternary alluvium and basin deposits, the moderate sensitivity Modesto Formation, the moderate sensitivity Riverbank Formation, and the low- to moderate-sensitivity Cortina Formation. Construction activities associated with the Delevan Pipeline within the potentially fossiliferous member of the GVS, or within moderate sensitivity formations, would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Geologic units that would be affected by construction of the Delevan Pipeline Intake Facilities consist of low sensitivity Quaternary alluvium deposited by the Sacramento River and the underlying moderate sensitivity Modesto Formation and high sensitivity Tehama Formation. Construction activities associated with the Delevan Pipeline Intake Facilities, within moderate and high sensitivity formations, would result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Excavations associated with the demolition of existing structures would be limited to previously disturbed sediments of no paleontological sensitivity, and the installation of fencing and creation of a fuelbreak would not involve excavations, and therefore, would not impact paleontological resources. Construction activities associated with the Project Buffer would, therefore, have **no impact** on paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

16.3.7 Impacts Associated with Alternative B

16.3.7.1 Geology and Soils

Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to geology and soils:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**), as described for Alternative A.

If Alternative B is implemented, the footprint or construction disturbance area of Sites Reservoir and Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. Impacts due to geology and soils (**Impact Geo/Soils-1**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**) would be the same for Alternative B as was described for Alternative A. The effects of operation and maintenance activities associated with these facilities on soil erosion would be the same as described for Alternative A. The differences in the effects of construction activities between alternatives relative to soil erosion are described below.

Sites Reservoir Inundation Area (1.81 MAF)

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

During Project operation, reservoir surface elevations would fluctuate between a minimum of 340 feet and 520 feet. Shoreline erosion would occur along the zone of reservoir-elevation fluctuation and would have a greater impact than Alternative A because a greater surface area would be exposed to wave action and associated erosion. Sediment delivery into the reservoir resulting from shoreline erosion would be retained within the reservoir, similar to that described for Alternative A. Soil erosion impacts from Project construction, operation, and maintenance are considered **potentially significant**.

Sites Reservoir Dams

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

Construction erosion impacts associated with Alternative B would be similar to those described for Alternative A. However, because of the total of nine saddle dams with Alternative B (compared to seven with Alternative A), and larger footprints for Sites and Golden Gate dams, overall construction erosion impacts associated with the Alternative B dams would increase. Increased soil erosion would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Discharge Facilities

Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil

The footprint of the Delevan Pipeline Discharge Facility included in Alternative B would be less than half the size of the Delevan Pipeline Intake Facilities described for Alternative A; therefore, construction erosion impacts associated with this facility would be less than that described for Alternative A. However, the increased soil erosion associated with construction activities would still result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

16.3.7.2 Minerals

Extended, Secondary, and Primary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to known mineral resources of value (**Impact Min-1**), locally important resources (**Impact Min-2**), and naturally occurring asbestos (**Impact Min-3**), would be the same as described for Alternative A for the Extended, Secondary, and Primary study areas.

16.3.7.3 Paleontology

Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to paleontological resources (**Impact Paleo-1**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to paleontological resources:

- Recreation Areas
- Sites Electrical Switchyard
- Sites Pumping/Generating Plant
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on paleontological resources (**Impact Paleo-1**) as described for Alternative A.

The major differences between Alternatives B and A are related to the increased size of Sites Reservoir with Alternative B. The increase in reservoir size necessitates the addition of two saddle dams and the movement of various project components. In addition, Alternative B replaces the Delevan Pipeline Intake Facilities with the Delevan Pipeline Discharge Facility. The Alternative B facilities' construction impacts on paleontological resources that would differ from those described for Alternative A are discussed below.

Sites Reservoir Inundation Area (1.81 MAF)

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The reservoir included in Alternative B would be larger than for Alternative A, but would affect the same geologic units. These units consist of the low sensitivity Boxer Formation and the low- to moderate-sensitivity Cortina Formation, as well as low sensitivity basin fill. However, the larger reservoir may result in greater effects to paleontological resources than would occur with Alternative A. Construction of the 1.81-MAF Sites Reservoir would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Reservoir Dams

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The larger Sites Reservoir Inundation Area included in Alternative B necessitates slightly different locations for each dam and a larger excavation area for the footprints of Sites and Golden Gate dams, and therefore, may result in greater effects to paleontological resources than would occur with Alternative A. The effects on paleontological resources from construction of Alternative B's Sites and Golden Gate dams would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, Alternative B includes nine saddle dams, whereas Alternative A includes seven saddle dams, so more area would be disturbed with Alternative B than with Alternative A. The saddle dams would be located around the rim of Sites Reservoir, and therefore, would affect the low sensitivity Boxer Formation and low sensitivity basin fill, similar to that described for Alternative A. The effects on paleontological resources from construction of the Alternative B saddle dams would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

Excavations for Alternative B would be slightly less extensive than for Alternative A. The lengths of the saddle dam access roads would be reduced for Alternative B because the dams would be larger and are located closer to the main roads. This would, therefore, reduce the potential impacts to paleontological resources in those areas. However, an extension of an access road would be constructed for Alternative B to provide access from Saddle Dam 3 to Saddle Dams 1 and 2. This road extension would affect the Boxer Formation and overlying low sensitivity basin fill. Effects on paleontological resources from construction associated with road relocations and the South Bridge would be similar for Alternative B to the impacts described for Alternative A and would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The length of the proposed Delevan Transmission Line for Alternative B is greatly reduced from the length associated with Alternative A and would extend only from the Sites Electrical Switchyard to its connection with the existing WAPA or PG&E transmission line. Effects on paleontological resources from construction of the Alternative B transmission line would, therefore, be greatly reduced, when compared to the Alternative A transmission line. The Alternative B transmission line would extend through the westernmost margin of the Sacramento Valley, and would affect the low- to moderate-sensitivity Cortina Formation and low sensitivity basin fill, and would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Discharge Facility

Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources

The smaller size of the Delevan Pipeline Discharge Facility, when compared to the Delevan Pipeline Intake Facilities that are included in Alternative A, would lessen the effects to high and moderate paleontologically sensitive formations. Impacts to paleontological resources would be similar to those discussed for Alternative A and would, therefore, result in a **potentially significant impact** to paleontological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

16.3.8 Impacts Associated with Alternative C

16.3.8.1 Geology and Soils

Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to geology and soils:

- Recreation Areas
- Sites Pumping/Generating Plant

- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**) as described for Alternative A.

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts on geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Areas, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to geology and soils (**Impact Geo/Soils-1**), soil erosion and loss of topsoil (**Impact Geo/Soils-2**), the level of risk to life and property from activities on expansive soil (**Impact Geo/Soils-3**), and soils that are incapable of supporting septic tanks or alternative wastewater disposal systems (**Impact Geo/Soils-4**) as described for Alternative B.

16.3.8.2 Minerals

Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to known mineral resources of value (**Impact Min-1**), locally important resources (**Impact Min-2**), and naturally occurring asbestos (**Impact Min-3**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to minerals:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on known mineral resources of value (**Impact Min-1**), locally important resources (**Impact Min-2**), and naturally occurring asbestos (**Impact Min-3**) as described for Alternative A.

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to known mineral resources of value (**Impact Min-1**), locally important resources (**Impact Min-2**), and naturally occurring asbestos (**Impact Min-3**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Areas, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to known mineral resources of value (**Impact Min-1**), locally important resources (**Impact Min-2**), and naturally occurring asbestos (**Impact Min-3**) as described for Alternative B.

16.3.8.3 Paleontology

Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to paleontological resources (**Impact Paleo-1**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to paleontological resources:

- Recreation Areas
- Sites Electrical Switchyard
- Sites Pumping/Generating Plant
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on paleontological resources (**Impact Paleo-1**) as described for Alternative A.

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to paleontological resources (**Impact Paleo-1**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams, Recreation Areas, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to paleontological resources (**Impact Paleo-1**) as described for Alternative B.

16.4 Mitigation Measures

Mitigation measures are provided below and summarized in Tables 16-9 and 16-10 for the impacts that have been identified as significant or potentially significant.

16.4.1 Geology and Soils

Table 16-9
Summary of Mitigation Measures for
NODOS Project Impacts to/from Geology and Soils

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Geo/Soils-2: Project Construction, Operation, and Maintenance Effects on Soil Erosion and Loss of Topsoil	Sites Reservoir Inundation Area, Sites Reservoir Dams, Recreation Areas, Road Relocations and South Bridge, Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline Intake Facilities, Project Buffer	Potentially Significant	Mitigation Measure Geo/Soils-2: Prepare and Implement a Project Construction Erosion Control Plan and a Project Operation and Maintenance Erosion and Sediment Control Plan Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant

Table 16-9
Summary of Mitigation Measures for
NODOS Project Impacts to/from Geology and Soils

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Geo/Soils-3: Risks to Life and Property from Project Construction, Operation, and Maintenance on Expansive Soil	Recreation Areas, Road Relocations and South Bridge, Sites Pumping/Generating Plant, Tunnel, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, GCID Canal Facilities Modifications, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard	Potentially Significant	Mitigation Measure Geo/Soils-3: Perform a Geotechnical Investigation due to Expansive Soils at Project Facility Sites	Less than Significant
Impact Geo/Soils-4: Project Construction, Operation, and Maintenance Effects on Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal	Field Office Maintenance Yard	Potentially Significant	Mitigation Measure Geo/Soils-4: Implement Measures for Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Geo/Soils-2: Prepare and Implement a Project Construction Erosion Control Plan and a Project Operation and Maintenance Erosion and Sediment Control Plan

To minimize soil erosion and loss of topsoil, DWR and Reclamation shall include in the construction contract the requirement for the preparation of an Erosion Control Plan prior to the start of Project construction and its implementation during Project construction. DWR and Reclamation shall also prepare an Erosion and Sediment Control Plan that shall be implemented during Project construction, operation, and maintenance. The Plans shall meet all local requirements and incorporate Best Management Practices (BMPs). BMPs may include, but would not be limited to:

- Preservation of existing vegetation
- The use of silt fences and/or straw bales and sheetpiles to separate project construction sites from waterways.

- Covering soil stockpiles with mulch or matting, as well as continuous maintenance of erosion control measures
- PennzSuppress® dust suppressant, or an equivalent product, to stabilize soil during and after construction
- Timely revegetation of disturbed sites to minimize post-construction erosion impacts. The use of native seeds and plants to assist in the conservation and enhancement of protected species shall be considered, as required by Section 7(a)(1) of the Endangered Species Act (ESA).

Mitigation Measure SW Qual-1c (2): Prepare and Implement a Stormwater Pollution Prevention Plan

The Project is subject to construction-related stormwater permit requirements of the Clean Water Act National Pollutant Discharge Elimination System (NPDES) Permit Program. DWR and Reclamation shall obtain any required permits through the CVRWQCB before any ground-disturbing construction activities occur. DWR and Reclamation shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that identifies BMPs to prevent or minimize the introduction of contaminants into surface waters. BMPs for the Project could include, but are not limited to, silt fencing, straw bale barriers, diversion ditches, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrance. The SWPPP shall include development of site-specific structural and operational BMPs to prevent and control impacts on runoff quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means.

Mitigation Measure Geo/Soils-3: Perform a Geotechnical Investigation due to Expansive Soils at Project Facility Sites

A site-specific design-level geotechnical investigation, prepared by a licensed professional, shall be performed. The geotechnical investigation shall include measures to ensure potential damage related to expansive soils and non-uniformly compacted fill and engineered fill are minimized. Mitigation options may range from removal of the problem soils, and replacement, as needed, with properly conditioned and compacted fill, to design and construction of improvements to withstand the forces exerted during the expected shrink-swell cycles and settlements. All design criteria and specifications set forth in the geotechnical investigation shall be implemented to reduce impacts associated with problem soils.

Mitigation Measure Geo/Soils-4: Implement Avoidance Measures for Soils that are Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems where Sewers are not Available for the Wastewater Disposal

During Project design, Project engineers shall consider the soil types when designing the necessary septic tank facilities, and shall incorporate and implement measures to accommodate such facilities or their alternatives. Alternatives could include mound, lagoon, or constructed wetlands systems (University of Kentucky, 2001).

Implementation of **Mitigation** Measures **Geo/Soils-2, Geo/Soils-3, and Geo/Soils-4** would reduce the level of significance of Project impacts to geology and soils to **less than significant**.

16.4.2 Minerals

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

16.4.3 Paleontology

Table 16-10
Summary of Mitigation Measures for
NODOS Project Impacts to Paleontological Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Paleo-1: Project Construction, Operation, and Maintenance Effects on Paleontological Resources	All Project Facilities, with the exception of the Project Buffer	Potentially Significant	Mitigation Measure Paleo-1a: Retain a Qualified Paleontological Resource Specialist Prior to the Start of Construction	Less than Significant
			Mitigation Measure Paleo-1b: Consultation with the Paleontological Resource Specialist Prior to and During Project Construction	
			Mitigation Measure Paleo-1c: Prepare and Implement a Paleontological Resources Monitoring and Mitigation Plan	
			Mitigation Paleo-1d: Conduct Paleontological Resources Awareness Training	
			Mitigation Measure Paleo-1e: Conduct Monitoring During Project Construction and Prepare Monthly Reports	
			Mitigation Measure Paleo-1f: Ensure Implementation of the Paleontological Resources Monitoring and Mitigation Plan	

Note:
LOS = Level of Significance

The significance of paleontological resources originates chiefly in their scientific value. Therefore, mitigation of impacts to paleontological resources can be achieved by the recovery of those values. This is accomplished through paleontological resources monitoring, and the scientific recovery of discovered fossils when they are encountered. Through the controlled excavation, study, and appropriate museum curation of fossil materials their scientific value is preserved, and potentially even enhanced through the new knowledge developed during their initial study. These mitigation measures are consistent with those recommended by the Society of Vertebrate Paleontology (SVP, No Date).

Mitigation Measure Paleo-1a: Retain a Qualified Paleontological Resource Specialist Prior to the Start of Construction

DWR and Reclamation shall retain a qualified Paleontological Resource Specialist at least 90 days prior to the start of construction. DWR and Reclamation shall keep resumes on file for the Paleontological Resource Specialist as well as qualified Paleontological Resource Monitors working on the Project. The Paleontological Resource Specialist shall meet the minimum or equivalent qualifications for a paleontological resources manager, as described in the Society of Vertebrate Paleontology guidelines of 1995. The experience of the Paleontological Resource Specialist shall include the following:

- Ability to recognize and collect fossils in the field
- Geological and biostratigraphic expertise
- Proficiency in identifying vertebrate and invertebrate fossils, and in assessing their scientific significance
- At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities

DWR and Reclamation shall ensure that the Paleontological Resource Specialist obtains qualified paleontological resource monitors to monitor Project construction activities, as the Paleontological Resource Specialist determines necessary on the Project. Paleontological Resource Monitors shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California
- AS or AA in geology, paleontology, or biology and four years' experience monitoring in California
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California

Mitigation Measure Paleo-1b: Consultation with the Paleontological Resource Specialist Prior to and During Project Construction

At least 30 days prior to the start of Project construction, DWR and Reclamation shall provide maps or drawings to the Paleontological Resource Specialist that show the planned construction footprint. Maps shall identify all areas of the Project where ground disturbance is anticipated. (Site grading plan and plan and profile drawings for the utility lines are appropriate for this purpose). The plan drawings shall show the location, depth, and extent of all ground disturbances affecting paleontologically sensitive sediment. If Project construction proceeds in phases, maps and drawings may be submitted prior to the start of each phase. In addition, the proposed schedule of each Project phase shall be provided to the Paleontological Resource Specialist. Before work commences on affected phases, DWR and Reclamation shall notify the Paleontological Resource Specialist of any construction phase scheduling changes. If paleontological resources monitoring is ongoing, DWR and Reclamation shall ensure that the Paleontological Resource Specialist or Paleontological Resource Monitor consults weekly with the Project superintendent or construction field manager to confirm area(s) to be worked the following week and until ground disturbance is completed.

Mitigation Measure Paleo-1c: Prepare and Implement a Paleontological Resources Monitoring and Mitigation Plan

DWR and Reclamation shall ensure that the Paleontological Resource Specialist prepares a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by DWR and Reclamation shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for paleontological resources monitoring, collecting, and sampling activities, and may be modified by the Paleontological Resource Specialist to accommodate new data or Project changes.

This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the Paleontological Resource Specialist, each monitor, DWR's and Reclamation's on-site manager, and DWR and Reclamation.

The PRMMP shall be developed in accordance with professional guidelines, and be consistent with those issued by the Society of Vertebrate Paleontology (SVP, No Date), and shall include, but not be limited to, the following:

Procedures for the performance and sequence of resource-related tasks, such as any literature searches, pre-construction surveys, appropriate worker environmental training module, construction monitoring, mapping and data recovery, discovery situations, fossil preparation and collection, identification and inventory, preparation of final reports, transmittal of materials for curation, and final report shall be provided in the PRMMP, including:

- A discussion of the geologic units expected to be encountered, the location and depth of the units relative to the Project, when known, and the known paleontological sensitivity of those units
- A discussion of the locations of where the monitoring of Project construction activities is deemed necessary, and a proposed plan for monitoring and sampling
- An explanation of why, how, and how much sampling is expected to take place and in what units, including descriptions of different sampling procedures that may be used
- A discussion of procedures to be followed in the event of a significant fossil discovery, diverting construction away from a find, resuming construction, and how notifications will be performed
- A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits
- Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources
- Identification of the institution(s) that will be approached to receive data and fossil materials collected, and requirements or specifications for materials delivered for curation

The PRMMP shall also provide guidance for preparation of a Paleontological Resources Report by the designated Paleontological Resource Specialist at the conclusion of ground-disturbing activities that may affect paleontological resources. The Paleontological Resources Report shall include an analysis of the collected fossil materials and related information, including a description and inventory of recovered fossil materials, a map showing the location of paleontological resources encountered, determinations of sensitivity and significance, and a statement by the Paleontological Resource Specialist that Project impacts to paleontological resources have been mitigated below the level of significance.

Mitigation Measure Paleo-1d: Conduct Paleontological Resources Awareness Training

Prior to ground disturbance and for the duration of Project construction activities involving ground disturbance, the Paleontological Resource Specialist shall prepare, and DWR and Reclamation shall conduct, weekly paleontological resources awareness training for the following workers: project managers, construction supervisors, forepersons, and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in paleontologically sensitive sediments prior to receiving paleontological resources awareness training. Worker training shall consist of a video or in-person presentation. The paleontological resources awareness training module may be combined with other training modules prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern.

The paleontological resources awareness training shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources. The training shall include:

- A discussion of applicable laws and penalties under the law
- Good quality photographs or physical examples of vertebrate fossils
- Information that the Paleontological Resource Specialist or Paleontological Resource Monitor has the authority to halt or redirect construction in the vicinity of a fossil discovery or unanticipated impact to a paleontological resource
- Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the Paleontological Resource Specialist or Paleontological Resource Monitor
- An informational brochure that identifies reporting procedures in the event of a discovery
- A certification of completion form signed by each worker indicating that he/she has received the training

Mitigation Measure Paleo-1e: Conduct Monitoring During Project Construction and Prepare Monthly Reports

DWR and Reclamation shall ensure that the Paleontological Resource Specialist and Paleontological Resource Monitor(s) monitor construction excavations consistent with the PRMMP in areas where potential fossil-bearing materials have been identified, both at reservoir sites and along any constructed linear facilities associated with the Project. In the event that the Paleontological Resource Specialist determines full-time monitoring is not necessary in locations that were identified as potentially fossil-bearing in the PRMMP, the Paleontological Resource Specialist shall notify DWR and Reclamation.

DWR and Reclamation shall ensure that the Paleontological Resource Specialist and Paleontological Resource Monitor(s) have the authority to halt or redirect construction if paleontological resources are encountered. DWR and Reclamation shall ensure that there is no interference with monitoring activities, as directed by the Paleontological Resource Specialist.

DWR and Reclamation shall ensure that the Paleontological Resource Specialist prepares and submits monthly summaries of monitoring and other paleontological resources management activities. The summary shall include the name(s) of the Paleontological Resource Specialist or Paleontological Resource Monitor(s) active during the month, general descriptions of training and monitored construction activities; and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings, if any, and a list of identified fossils. A final section of the report shall address any issues or concerns about the Project relating to paleontological resources mitigation activities, including any incidents of non-compliance or any changes to the monitoring plan by the Paleontological Resource Specialist. If no monitoring took place during the month, the report shall include an explanation as to why monitoring was not conducted.

Mitigation Measure Paleo-1f: Ensure Implementation of the Paleontological Resources Monitoring and Mitigation Plan

DWR and Reclamation, through the designated Paleontological Resource Specialist, shall ensure that all components of the PRMMP are adequately performed during construction.

Implementation of **Mitigation Measures Paleo-1a, Paleo-1b, Paleo-1c, Paleo-1d, Paleo-1e**, and **Paleo-1f** would reduce the level of significance of Project impacts to paleontological resources to **less than significant**.

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Figures

Legend

- Delevan Transmission Line and Pipeline
- Proposed Sites Reservoir
- Geomorphic Provinces of California

FIGURE 16-1
Geomorphic Provinces of California
North-of-the-Delta Offstream Storage Project

0 20 40 80 120 160 Miles

N

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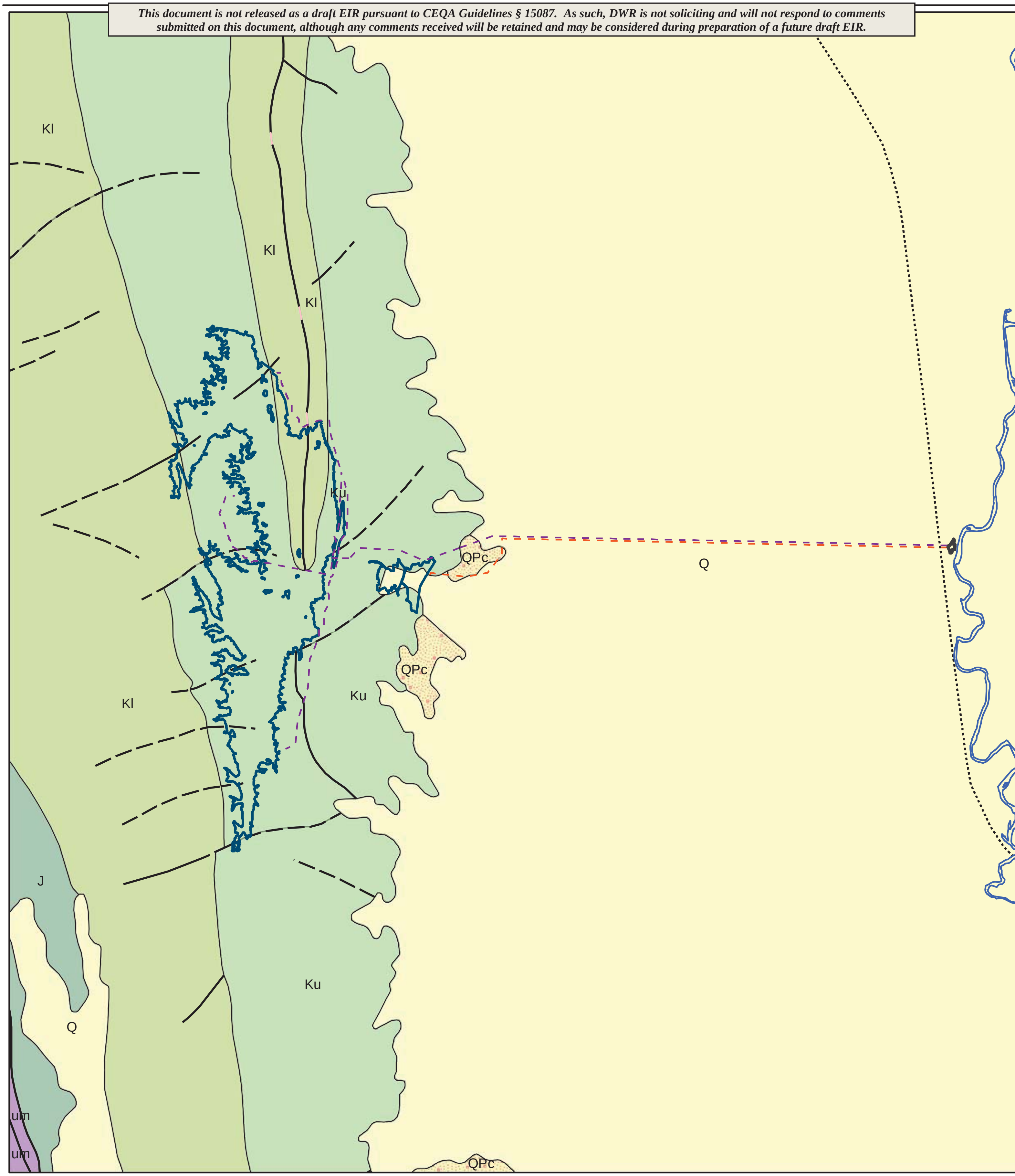

Legend

- Delevan Transmission Line
- Delevan Pipeline
- Sites, Funks, and Holthouse Reservoirs
- Delevan Pipeline Intake Structure

FIGURE 16-2
Generalized Geologic Map of the Primary Study Area
North-of-the-Delta Offstream Storage Project

0 1 2 4 6 8 Miles

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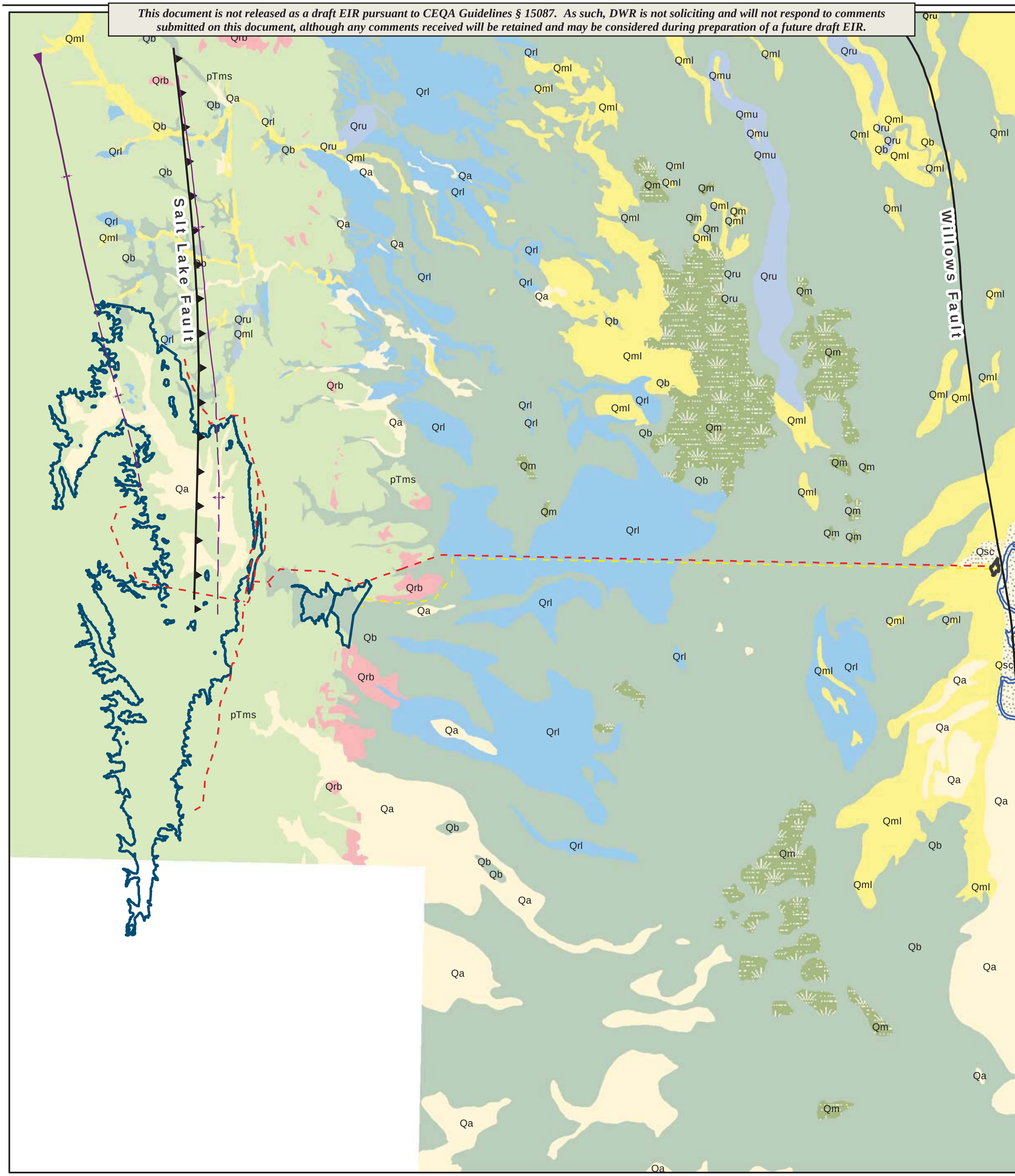

Legend

- Delevan Transmission Line
- Delevan Pipeline
- Delevan Pipeline Intake Structure
- Sites, Funks, and Holthouse Reservoirs

FIGURE 16-3
Rock Units Within the Sacramento Valley
North-of-the-Delta Offstream Storage Project

0 0.75 1.5 3 4.5 6 Miles

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17. Faults and Seismicity

17.1 Introduction

This chapter describes the faults and seismicity setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for faults and seismicity is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

17.2 Environmental Setting/Affected Environment

17.2.1 Introduction

17.2.1.1 Fault Activity Classification

Faults are classified as active, potentially active, or inactive by the California Geological Survey (CGS), based on the age of most recent activity, as defined below:

- Historic faults have experienced surface rupture during historic time (approximately the last 200 years) and are associated with either a recorded earthquake with surface rupture, measurable surface displacement along a fault in the absence of notable earthquakes (aseismic creep), or displaced fault survey lines.
- Holocene age faults have had surface displacement within the past 11,000 years, as demonstrated by young geomorphic evidence, offset young deposits, or radiometrically dated material.
- Late Quaternary age faults show evidence of surface rupture within approximately the last 700,000 years, as demonstrated using the same geomorphic evidence as for Holocene faults.
- Quaternary age faults show evidence of surface rupture younger than approximately 1.6 million years ago, including faults that displace undifferentiated Plio-Pleistocene age deposits.
- Pre-Quaternary age faults show no evidence of movement within the Quaternary (approximately the past 1.6 million years) or lack evidence of displacement of younger deposits. Also included in this category are known faults for which detailed studies have not determined fault activity, and those faults identified only in preliminary mapping (Jennings, 1999).

The classification of “active” is applied to historic and Holocene age faults, “potentially active” is applied to Quaternary and late Quaternary age faults, and “inactive” is appied to pre-Quaternary age faults. These classifications were developed by the CGS and were adopted by the Alquist Priolo Act (1972) to help delineate Special Studies Zones where detailed geologic investigations are required prior to development. These classifications are not meant to imply that inactive fault traces will not rupture, only that they have not been shown to have ruptured for some time and the probability of fault rupture is low. The Alquist

Priolo Special Studies Zones do not address subsurface or “blind” faults, which can cause significant earthqauke damage without surface rupture.

The California Department of Water Resources, Division of Safety of Dams (DSOD) has published “Fault Activity Guidelines” (Fraser, 2001) that uses a more stringent criteria on fault activity classification than CGS. Its publication defines an active fault as having ruptured within the last 35,000 years. A conditionally active fault is defined as having ruptured in the Quaternary, but its displacement history during the last 35,000 years is unknown. Fault inactivity is demonstrated by a confidently located fault trace that is consistently overlain by unbroken geologic materials older than 35,000 years. Faults that have no indication of Quaternary activity are presumed to be inactive, except in regions of sparse Quaternary cover.

Table 17-1 compares the difference in fault activity classifications between CGS and DSOD. For this chapter, the more stringent fault activity classification set forth by DSOD is used.

Table 17-1
Comparison of Fault Activity Classification between the California Geological Survey and Division of Safety of Dams

Period	Epoch	Years Before Present	Fault Activity Classification	
			CGS	DSOD
Quaternary	Holocene	0 to 12,000 years	**Active** (Up to 11,00 years)	**Active** (Up to 35,000 years)
	Pleistocene	12,000 to 1.6 million years	**Potentially active** (Up to 1.6 million years)	**Conditionally active** (Up to 1.6 million years)
Pre-Quaternary			**Inactive** (Greater than 1.6 million years	**Inactive** (Greater than 1.6 million years

Notes:
CGS = California Geological Survey
DSOD = Division of Safety of Dams

17.2.1.2 Earthquake Magnitude and Intensity Measurement

Earthquake magnitude is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by the seismographic or geologic observations. It does not vary with distance or the underlying earth material. This differs from earthquake intensity, which is a qualitative measure of the effects a given earthquake has on people, structures, loose objects, and the ground at a specific location. Intensity generally increases with increasing magnitude and in areas underlain by unconsolidated materials, and decreases with distance from the hypocenter (source of seismic energy) (CGS, 2002).

Several magnitude scales have been developed by seismologists. The original is the Richter magnitude, which measures the maximum trace amplitude registered on a seismogram. With appropriate distance corrections for the appropriate amplitude, the magnitude value is constant and is an effectice means of earthquake size classification.

The most commonly used scale is the moment magnitude scale. Moment magnitude is related to the physical size of fault rupture and the movement or displacement across the fault, and as such, is a more uniform measure of the strength of an earthquake. Another measure of earthquake size is seismic moment. The seismic moment determines the energy that can be radiated by an earthquake. The moment magnitude of an earthquake is defined relative to the seismic moment for that event.

An earthquake's magnitude is expressed in whole numbers and decimals (e.g., M6.8).

Earthquake intensity in a given location is typically measured using the Modified Mercalli intensity scale with values ranging from I to XII. The most commonly used adaptation covers the range of intensities from "I" (not felt except by very few, favorably situated), to "XII" (total damage, lines of sight disturbed, and objects thrown into the air).

Although an earthquake has only one magnitude, it can have many intensities that typically decrease with distance from the epicenter. Table 17-2 presents an approximate relationship between magnitude and maximuim expected intensity close to the epicenter.

Table 17-2
Comparison of Richter Magnitude and Modified Mercalli Intensity

Richter Magnitude	Expected Modified Mercalli Maximum Intensity (at epicenter)	
	Intensity	Observations and Effects
2	I – II	Usually detected only by instruments
3	III	Felt indoors
4	IV – V	Felt by most people; slight damage
5	VI – VII	Felt by all; many frightened and run outdoors; damage minor to moderate
6	VII – VIII	Everybody runs outdoors; damage moderate to major
7	IX – X	Major damage
8+	X – XII	Total and major damage

Source: Richter, 1958.

17.2.2 Extended Study Area

California straddles the juncture of two great crustal plates: the Pacific Plate and the North American Plate (CGS, 2003a). The cities of Monterey, Santa Barbara, Los Angeles, and San Diego are located on the Pacific Plate, which is constantly moving northwestward past the North American Plate. The North American Plate includes the remainder of California east of the San Andreas Fault[1]. The San Andreas Fault extends from the Gulf of California northwestward to Mendocino County and ends at the "Triple Junction" offshore of Cape Mendocino. The Triple Junction is where the American Plate, Pacific Plate, and the off-shore Gorda Plate meet. The relative rate of movement is approximately two inches (50 millimeters [mm]) per year. In California, approximately 40 mm per year of the slip occurs on the faults of the San Andreas system, and about 10 mm per year of slip occurs on faults in the Mojave Desert and Basin and Range area, east of the Sierra Nevada (a system known as the eastern California shear zone).

The constant motion of the crustal plates causes stress in the brittle upper crust of the earth. These tectonic stresses build up as the rocks are gradually deformed. This rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a

[1]Fractures in the earth's crust along which the rocks on one side have shifted relative to those on the other side are called faults. The total amount of displacement along a fault may be a few inches or many miles if it has accumulated over millions of years. Faults are more likely to have future earthquakes if they have had more recent earthquakes along them, have had greater total displacement, and are aligned so that movement can relieve the accumulating tectonic stresses.

fault. The rocks on opposite sides of the fault slide past each other as the rocks spring back to a relaxed position. The strain energy is released partly as heat and partly as seismic waves. These seismic waves produce the ground shaking of an earthquake.

There are thousands of recognized faults in California, hundreds of which have been given formal names, but only a very small number of these pose significant hazards. These faults are shown relative to the CVP and SWP service areas within the Extended Study Area (Figure 17-1). The motion between the Pacific and North American plates occurs primarily on the faults of the San Andreas Fault system and the eastern California shear zone. Other faults have much lower rates of movement, and correspondingly longer times between significant earthquakes.

Ground shaking from large earthquakes is responsible for most of the damage caused by earthquakes. Damage to structures is related to the type and quality of construction, and foundation materials. Building codes have been periodically revised to account for our current understanding of how earthquake shaking can damage buildings. Other earthquake hazards, including the surface rupture of a fault, and liquefaction and landslides that can be caused by the shaking, are significant hazards.

Earthquakes are detected every day in California by sensitive seismographs that record the very small vibrations of the earth. Each year, 100 to 150 earthquakes occur in the state that are big enough to be felt, but few of these cause damage. Earthquakes large enough to cause moderate damage to structures in the vicinity of the epicenter – those of M5 or larger – occur three or four times a year (CGS, 2003a).

On an average of once every two or three years, a moderate earthquake (M6 to 6.9) strikes somewhere in the state. An earthquake of this size, such as the Northridge (southern California) Earthquake of January 17, 1994 (M6.7) or the Coalinga (central California) Earthquake of May 2, 1983 (M6.5) is capable of causing major damage if the epicenter is near a densely populated area (CGS, 2003a).

Major earthquakes (M7 to 7.9) occur in California approximately every 10 years. Two recent major earthquakes, the Landers (San Bernardino County) Earthquake of June 28, 1992 (M7.3) and the Hector Mine (San Bernardino County) Earthquake of October 16, 1999 (M7.1) caused extensive surface fault rupture, but relatively little damage because they occurred in lightly populated areas of the Mojave Desert. Earthquakes of similar size, such as the M6.9 Loma Prieta (Santa Cruz County) Earthquake of October 17, 1989, cause extensive damage over large areas when they occur in densely populated regions. The two largest earthquakes in California, the Fort Tejon (Kern County) Earthquake of 1857 and the famous San Francisco Earthquake of 1906, were similar in magnitude (M7.9 and M7.8, respectively) and resulted from movement along the San Andreas Fault. Earthquakes of this size (M7.7 to 7.9) can cause more extensive damage over a larger area than the M7.1 to 7.4 earthquakes that have stricken California in recent decades (CGS, 2003a).

Great earthquakes (M greater than 8) have not occurred in California in historic time, but one earthquake in January 1700 may have been this large. Based on Native American oral histories, tree-ring studies, geological studies that show the uplift or subsidence of large areas of coastal land, and records of a tsunami that struck Japan and cannot be correlated with an earthquake anywhere else around the Pacific, a great (M9) earthquake occurred January 26, 1700 on the Cascadia Subduction Zone extending north from Cape Mendocino to British Columbia. An earthquake of this size is similar to the one that struck Alaska in 1964, and is capable of extensive damage over a very broad region (CGS, 2003a).

B.F. Sisk Dam, which impounds San Luis Reservoir, is near two seismic faults. It is 28 miles from the San Andreas Fault, and 23 miles from the Calaveras-Hayward Fault.

Reservoir-induced seismicity is a phenomenon where the weight of large deep reservoirs and the increased pore pressures trigger small localized earthquakes. Within the Extended Study Area, San Luis Reservoir has been suspected of creating reservoir-induced seismicity (William Lettis & Associates, Inc., 2002; Probe International, 2008).

During a period of rapid inflow in January and February 1969, a four-fold increase in seismic activity was recorded in the vicinity of San Luis Reservoir, followed by an additional 38 events during the remainder of the year. Subsequent to this, seismicity returned to background levels (Anderson et al., 1982). In 1974, 11 earthquakes occurred at the southern end of the reservoir during a period when there were minimal changes in water level. This subsequent series of events brought into question whether the 1969 activity was related to reservoir-induced seismicity (Wong and Strangberg, 1996).

17.2.3 Secondary Study Area

Faults and seismicity are a regional phenomenon. Movement on faults within the Secondary Study Area could have potential effects on Project features within the Primary Study Area. Although this discussion addresses faults and seismicity within the Secondary Study Area, their location relative to the Primary Study Area has been included.

Table 17-3 lists the locations of regionally active faults and potentially active faults significant to the Secondary Study Area due to proximity, activity status, date of most recent motion, and maximum moment magnitude (Mmax)[2]. Figure 17-2 shows the active and potentially active faults within the Secondary Study Area that could affect the operation of the proposed Project.

Table 17-3
Regional Active and Potentially Active Faults in the Secondary Study Area

Fault	Fault Type	Recency of Movement	Fault Classification	Maximum Moment Magnitude (Mmax)
San Andreas	Strike Slip	Holocene	Active	~8.0
Maacama Fault	Strike Slip	Holocene	Active	6.5
Bartlett Springs	Strike Slip	Holocene	Active	6.6
Coast Range	Normal	Late Pliocene	Not Active	Not characterized
Green Valley	Thrust	Pre-Late Quaternary	Not Active	Not characterized
Stony Creek	Thrust	Pre-Quaternary	Not Active	Not characterized
Great Valley	Blind Thrust	Holocene	Assumed to be Active	6.8
Corning	Blind Reverse	Late Pleistocene	Active	Not characterized
Cleveland Hills	Normal	Holocene	Active	5.7
Cascadia Subduction Zone	Megathrust	Holocene	Active	9

Source: William Lettis & Associates, Inc., 2002.

The right-lateral San Andreas Fault system forms the boundary between the North American and Pacific plates. The San Andreas Fault trends southeast from Cape Mendocino to the Gulf of California. Between Cape Mendocino and San Francisco, some portions of the fault lie off the coast of California. The San Andreas Fault has experienced significant activity during historic time, most recently during the 1989 Loma Prieta Earthquake (M6.9), which resulted in widespread damage throughout the Bay Area.

[2] The Mmax is the strongest earthquake that is likely to be generated along a fault. It is based on empirical relationships of surface rupture length, rupture area, and fault type, which are all related to the physical size of fault rupture and displacement across a fault.

Prior to that, the 1906 San Francisco Earthquake (estimated at M7.9) caused approximately 290 miles of surface fault rupture from Tomales Bay southward.

East of the San Andreas Fault, several strike-slip faults occur in northwest trending valleys, including the Maacama Fault and the Bartlett Springs Fault. Both faults have been active in Holocene time and are capable of producing seismic events up to M6.6. The CGS has published several Alquist-Priolo maps along both of these faults.

Further east, several inactive faults (Coast Range, Green Valley, and Stony Creek) occur at or near the contact between the Franciscan Formation and the Great Valley Sequence. Movement along these fault planes is generally attributed to eastward compression of the Coast Range and slippage along bedding planes. These three faults are considered not active.

The Great Valley Fault is a low-angle blind thrust fault located along the west side of the Sacramento and San Joaquin valleys. The fault plane is deepest to the west in rocks of the Coast Range Geomorphic Province and trends upward into sedimentary rocks of the Great Valley Geomorphic Province. It is a main component of the Coast Ranges-Sierran Block Boundary Zone, a broad compressional boundary between the Pacific Plate and the Sierra Nevada Microplate of North America (William Lettis & Associates, Inc., 2002). In its closest proximity to the Primary Study Area, it is approximately four to seven miles below the surface. Historically, seismic activity has occurred along the Great Valley Fault in the Sacramento Valley, notably the 1889 Antioch Earthquake (M6) and the 1892 Winters earthquakes (M6+). In addition, a swarm of small earthquakes (M3.6 to M4.0) occurred in the region of Maxwell and Williams in late 1943 that are believed to have originated along the Great Valley Fault. The segment of the Great Valley Fault nearest to Primary Study Area is assumed to be active.

The Corning Fault is a blind reverse fault located west of the Sacramento River and extending from Red Bluff southward into Glenn County. The fault trace is not visible on the surface. Based on evidence of uplifting and folding of the Modesto Formation (late Pleistocene) across the trace of the fault, the Corning fault is considered active.

The Cascadia Subduction Zone is the boundary between the subducting Pacific Plate and the North American Plate. Its closest occurrence to the Primary Study Area is approximately 150 miles west-northwest offshore of northern California, north of Cape Mendocino. The zone extends north offshore of Oregon, Washington, and southern Canada. Geological investigations (Atwater et al., 1995; Nelson et al., 1995), geophysical modeling (Fluck et al., 1997; Hyndman and Wang, 1995), and historical tsunami records from Japan (Satake et al., 1996) provide the basis for the current scientific consensus that the Cascadia Subduction Zone has the potential to generate mega-earthquakes that may rupture the entire 1,500-mile length of the plate boundary, with seismic events exceeding M9. The most recent great earthquake is estimated to have occurred approximately 300 years ago in 1700, based on tree ring evidence and Japanese tsunami records. Paleoseismic data indicate that earthquakes of this size may occur every 500 to 600 years. Historically, the 1992 Cape Mendocino earthquake (M7 to M7.2) is the most recent earthquake to occur on the Cascadia Subduction Zone.

The Cleveland Hills Fault is a normal fault located south of Lake Oroville. In 1975, several earthquakes occurred along the fault; the greatest event was M5.7. Surface rupturing along the fault line occurred for several miles. The fault is considered active. One Alquist-Priolo Act map was published mapping areas of surface rupture along the fault line.

Figure 17-3 shows the locations of seismic events within the Secondary Study Area. The majority of the historical seismic activity is associated with movement along the Bartlett Springs and Maacama faults west of the Primary Study Area. The concentration of seismic activity to the northwest is associated with the "Triple Junction". Earthquake hazards are greater there because that region is part of the Cascadia Subduction Zone, where plate collisions increase the potential for huge earthquakes. A cluster of minor to moderate seismic events in the Oroville area is associated with the Cleveland Hill Fault. Additional minor seismic activity occurs throughout the Secondary Study Area, and is generally attributed to compressional forces between the Coast Range Geomorphic Province and the Great Valley Geomorphic Province. These minor seismic events occur at moderate depth with no surface expression exhibited (William Lettis & Associates, Inc., 2002).

The CGS has produced an Earthquake Shaking Potential for California Map (CGS, 2008a). The map indicates that seismic shaking potential in the Secondary Study Area ranges from low to high, with the highest potentials existing along the San Andreas Fault and other faults in the Coast Range and southern California.

Liquefaction is the loss of soil strength due to seismic forces generating various types of ground failure. The potential for liquefaction must account for soil types and density, the groundwater table, and the duration and intensity of ground shaking. The USGS has produced numerous maps of areas within the Secondary Study Area showing liquefaction potential (USGS, 1996a). Many areas, such as artificial fill adjacent to the San Francisco Bay, have a high liquefaction potential.

The CGS has produced numerous maps showing landslide features and delineating potential slope-stability problem areas (CGS, 2011a). Many areas within the Secondary Study Area have high landslide susceptibility (CGS, 2011b).

Within the Secondary Study Area, Shasta Lake and Lake Oroville have been suspected of creating reservoir-induced seismicity (William Lettis & Associates, Inc., 2002; Probe International, 2008).

17.2.4 Primary Study Area

17.2.4.1 Methodology

William Lettis & Associates, Inc. completed a Phase II Fault and Seismic Hazards Investigation for the NODOS Integrated Storage Investigations in 2002. The report focused on the area around the proposed Sites Reservoir, particularly the proposed damsites, and is the primary source of information presented for the Primary Study Area in this chapter.

17.2.4.2 Fault Rupture Potential

No faults of Holocene age (i.e., active faults) are known to occur within the Primary Study Area. No Alquist-Priolo Act maps have been published for areas within the Primary Study Area.

The Phase II Fault and Seismic Hazards Investigation for the NODOS Integrated Storage Investigations (William Lettis & Associates, Inc., 2002) identified several inactive faults in proximity to the proposed Sites Reservoir and the Sites and Golden Gate damsites (Table 17-4). Two major sets of surface faults were recognized:

1. Northeast-striking high-angle faults that obliquely cut across the north-striking bedrock units, and consistently displace stratigraphic contacts in a right-lateral sense. Specific examples of these

structures include the informally named GG-1, GG-2, GG-3 and S-2 faults, all of which pass directly through the proposed Sites and Golden Gate damsites or are located near them (Figure 17-4).

2. North-striking faults that are generally parallel to bedding (Figure 17-4). The most laterally continuous example of these structures is the Salt Lake Thrust Fault, which is parallel to, and east of, the axis of the Sites anticline[3]. The Salt Lake Thrust Fault is approximately 0.9 mile west of the proposed Golden Gate damsite, and the southern end of the fault is approximately 1.7 miles northwest of the proposed Sites damsite. The trace of the fault passes through the site of proposed saddle dam SSD-2.

The northeast-striking GG-1, GG-2, GG-3, and S-2 faults are tear faults accommodating compression of the overlying formations above the plane of the Great Valley Thrust Fault. Movement along these faults probably occurred as a co-seismic event of moderate to large magnitude earthquakes on the underlying Great Valley Thrust Fault and probably do not act as independent seismic sources (William Lettis & Associates, Inc., 2002).

The Salt Lake Thrust Fault is an offshoot of the Great Valley Thrust Fault trending upward. Trench investigations across the trace of the Salt Lake Thrust Fault indicated that at least one, and probably three or more, surface ruptures have occurred in the past 30,000 to 70,000 years. If rupture events have a regular recurrence, then the trench evidence suggests that at least one surface rupturing event probably has occurred in the past 35,000 years (William Lettis & Associates, Inc., 2002).

The Phase II Fault and Seismic Hazards Investigation for the NODOS Integrated Storage Investigations (William Lettis & Associates, Inc., 2002) concluded that a three- to eight-inch fault slippage could occur along the northeast-striking GG-1, GG-2, GG-3, and S-2 faults that are located beneath the Project damsites or are in proximity to them. This slippage is assumed to be related to movement at depth along the Great Valley Thrust Fault.

Table 17-4
Faults in Proximity to the Proposed Sites Reservoir and Sites and Golden Gate Damsites

Fault	Fault Length	Sense of Displacement	Fault Separation (Horizontal)	Fault Separation (Vertical)	Fault Width	Nearest Distance to Golden Gate Damsite	Nearest Distance to Sites Damsite	Time of Last Movement*
GG-1	1.1 miles	Right-lateral	246 ± 82 feet	Unknown	2 feet	< 0.5 mile	3.1 miles	Holocene deposits unfaulted
GG-2	3.7 miles	Right-lateral	1,312 ±196/-98 feet	Unknown	2 feet	< 0.5 mile	1.7 miles	Holocene deposits unfaulted
GG-3	3.0 miles	Right-lateral	1,574 ± 65 feet	Unknown	2 feet	< 0.5 mile	0.4 mile	Early Holocene deposits unfaulted
S-2	2.4 miles	Right-lateral	558 ±164/-180 feet	None	3 feet	2.2 miles	< 0.5 mile	Early Holocene deposits unfaulted
S-3	Unknown	Thrust (east side up)	Unknown	Unknown	6 feet	600 feet	0.9 mile	Older than, and offset by, Faults S-2, GG-3
Salt Lake Thrust Fault	> 7 miles	Thrust (east side up)	Unknown	> 10 feet	2 feet	1.7 miles	0.9 mile	Pleistocene gravels offset

*Youngest faulted or oldest deposits that cross the fault are given.

Source: William Lettis & Associates, 2002.

[3] An anticline is a fold with strata sloping downward on both sides from a common crest.

17.2.4.3 Seismic Ground Shaking

On the basis of a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded at a 10 percent probability in 50 years (CGS, 2003b), the probabilistic peak horizontal ground acceleration values within the Primary Study Area range from 0.1g to 0.3g (where g equals the acceleration speed of gravity). These values indicate that the ground-shaking hazard in the Primary Study Area is moderately low.

Ground shaking intensity is largely a function of distance from the earthquake epicenter and underlying geology. The Primary Study Area is located on bedrock of the Great Valley Sequence (western portion) and recent alluvial deposits (eastern portion). Focal depths are generally deeper than 15 miles (William Lettis & Associates, 2002). Historically, the Primary Study Area has a low seismic activity rate. Data from the Northern California Seismic Network database indicate that no seismic event greater than M4.5 has occurred since 1970. Sparse data from the historical seismic record show nothing greater than a M4.5 (William Lettis & Associates, 2002).

17.2.4.4 Seismic-Related Ground Failure including Liquefaction

Liquefaction is the sudden temporary loss of shear strength in saturated loose to medium dense granular sediments subjected to ground shaking. Liquefaction generally occurs when seismically induced ground shaking causes pore water pressure to increase to a point equal to the weight of the overlying soil and rock above the water table. Liquefaction can cause foundation failure of buildings and other facilities due to the reduction of foundation bearing strength. The potential for liquefaction depends on the duration and intensity of earthquake shaking, particle size distribution of the soil, density of the soil, and elevation of the groundwater. Areas at risk due to the effects of liquefaction are typified by a high groundwater table and underlying loose to medium-dense granular sediments, particularly younger alluvium and artificial fill.

Liquefaction potential is low in the western portion of the Primary Study Area because the soils are well-drained (i.e., low groundwater table) and decreased depth to bedrock. Liquefaction potential in the eastern portion is moderate due to the higher groundwater table and greater soil depth. Project features located in this area include the Holthouse Reservoir Complex, the TRR and its associated facilities, the Delevan Pipeline, the Delevan Pipeline Intake/Discharge Facilities, and the Delevan Transmission Line

17.2.4.5 Landslides

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Rock slopes exposed to either air or water can undergo rockfalls, rockslides, or rock avalanches; soil slopes experience shallow soil slides, rapid debris flows, and/or deep-seated rotational slides.

Landslide potential is low in the eastern portion of the Primary Study Area where the land profile is relatively flat. Landslide potential increases in the western upland portion where steeper slopes occur. Small to medium landslides have been observed on steep slopes within and adjacent to the proposed Sites Reservoir, particularly along the western side of Logan Ridge (eastern shoreline of proposed Sites Reservoir). These landslides occur in the Boxer Formation, which is composed primarily of mudstone. Small isolated rockslides have been observed within and adjacent to the proposed Sites and Golden Gate damsites. These rockslides occur in the Venado Sandstone member of the Cortina Formation.

17.2.4.6 Seiches and Tsunamis

The Primary Study Area is not located downslope of any large bodies of water, nor is it located within a coastal area. Therefore, existing hazards due to earthquake-induced seiches (wave oscillations in an enclosed or semi-enclosed body of water) or tsunamis (seismic sea waves) are negligible. The existing Funks Reservoir is considered too small to produce a significant seiche.

17.2.4.7 Reservoir-Induced Seismicity

The only existing reservoir within the Primary Study Area is Funks Reservoir. Depth of the water in the reservoir is the most important factor in reservoir-induced seismicity (Probe International, 2008). Funks Reservoir is too shallow to create reservoir-induced seismicity.

17.3 Environmental Impacts/Environmental Consequences

17.3.1 Regulatory Setting

Seismic hazards, as related to the building of structures, are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

17.3.1.1 Federal Plans, Policies, and Regulations

- National Earthquake Hazards Reduction Program Reauthorization Act of 2004

17.3.1.2 State Plans, Policies, and Regulations

- California Water Code, Division 3 Dams and Reservoirs
- Seismic Hazards Mapping Act of 1990
- Alquist-Priolo Earthquake Fault Zoning Act of 1972
- California Division of Mines and Geology Special Publication No. 42, Fault-Rupture Hazard Zones in California, 2007
- California Division of Mines and Geology Special Publication No. 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008
- California Code of Regulations, Title 23 Waters, Division 2 Department of Water Resources, Chapter 1 Dams and Reservoirs, Article 5

17.3.1.3 Regional and Local Plans, Policies, and Regulations

- Colusa County General Plan
- Glenn County General Plan

17.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for faults and seismicity:

Would the Project:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?
  - Strong seismic ground shaking?
  - Seismic-related ground failure, including liquefaction?
  - Landslides?
- Inundation by seiche, tsunami, or mudflow?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Exposure of people or structures to fault rupture, seismic ground shaking, seismic-related ground failure, liquefaction, or landslides.
- Inundation by seiches or tsunamis.
- Reservoir-induced seismicity (increased seismicity due to the presence of a new reservoir or re-operation of existing reservoirs).

17.3.3 Impact Assessment Assumptions and Methodology

17.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to existing seismic hazards and impacts to the Project from those seismic hazards:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and

industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.
- Likely sources of major regional seismicity would be from earthquakes to the west of the Project area in the Coast Range or from a very rare Cascadia Subduction Zone event (occurrence every 500 to 600 years).
- No undiscovered major faults or seismic sources would have an impact.

17.3.3.2 Methodology

A combination of data, published reports, and professional experience with initial investigations for the proposed Project was used to evaluate the alternatives for potential impacts due to faults and seismicity.

The Extended and Secondary study area impact assessments primarily relied on data and publications (both printed and web-based) from the California Geological Survey and the United States Geological Survey. The Primary Study Area impact assessments primarily relied on the Phase II Fault and Seismic Hazards Investigation for the NODOS Integrated Storage Investigations (William Lettis & Associates, Inc., 2002). Professional experience with initial investigations included geological mapping within the Primary Study Area and core-drilling within the footprints of the proposed damsites.

17.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

17.3.5 Impacts Associated with the No Project/No Action Alternative

17.3.5.1 Extended and Secondary Study Areas – No Project/No Action Alternative

<u>Construction, Operation, and Maintenance Impacts</u>

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to or from seismic hazards has been addressed in those environmental documents. In addition, the Project would not be constructed if this alternative is implemented. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Population growth will continue to occur throughout California throughout the period of Project analysis (i.e., 100 years), is included in the assumptions for the No Project/No Action Alternative, and as such, it may be expected to occur throughout the Extended and Secondary study areas. Growth within the counties is planned and guided in the various county General Plans, and structures that are constructed to accommodate such growth are expected to be constructed in suitable areas to applicable and appropriate seismic standards. In addition, the growth-inducing effects of the projects that are included in the No Project/No Action Alternative, as well as from planned growth in the counties that comprise the two study areas, are expected to have been addressed in the environmental documents that addressed those projects and County General Plans, pursuant to CEQA and/or NEPA. Therefore, growth would not affect these seismic hazards, and the seismic hazards are not expected to affect growth within the Extended or Secondary Study Area counties. Consequently, **there would not be a substantial adverse effect**, when compared to Existing Conditions. San Luis Reservoir, Shasta Lake, Lake Oroville, and Folsom Lake operations do not currently cause seismic hazards, and their continued operation is not expected to change that condition. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Seis-2: Inundation by Seiches or Tsunamis

The impacts of the projects that are included in the No Project/No Action Alternative have been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA. Their potential for impacts to or from seiches or tsunamis has been addressed in those environmental documents. In addition, the Project would not be constructed if this alternative is implemented. Population growth may be expected to occur throughout the Extended and Secondary study areas. The growth-inducing effects of the projects that are included in the No Project/No Action Alternative, as well as from planned growth in the counties that comprise the two study areas, are also expected to have been addressed in the environmental documents that addressed those projects and County General Plans, pursuant to CEQA and/or NEPA. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions. In addition, San Luis Reservoir, Shasta Lake, Lake Oroville, and Folsom Lake are not located on the coast, so they are not expected to cause or be affected by seiches or tsunamis. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Seis-3: Reservoir-Induced Seismicity

The impacts of the projects that are included in the No Project/No Action Alternative have been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA. Their potential for impacts to or from reservoir-induced seismicity has been addressed in those environmental documents. In addition, the Project would not be constructed if this alternative is implemented. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

The only examples of suspected reservoir-induced seismicity associated with existing State and federal reservoirs located within the Extended and Secondary study areas occurred over 35 years ago (San Luis Reservoir in 1969 and Lake Oroville in 1975). Major State and federal reservoirs within the Extended and Secondary study areas (Shasta, Folsom, San Luis, and Oroville) have been operated according to established engineering guidelines since their completion in 1945 (Shasta), 1956 (Folsom), 1967 (San Luis), and 1968 (Oroville) and will continue to operate according to these same guidelines in the future. The continued absence of reservoir-induced seismicity that has characterized the past 35 to 70 years of operation of these very large reservoirs should be anticipated in the future. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Modifications to operations of existing reservoirs would also have been evaluated pursuant to CEQA and/or NEPA, and any potentially significant or significant impact that was identified would have been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

17.3.5.2 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides

If the No Project/No Action Alternative is implemented, Sites Reservoir and its associated facilities would not be constructed. Therefore, Project-induced seismic impacts (including fault rupture, strong seismic ground shaking, and seismic-related ground failure) and liquefaction and landslides would be avoided in the Primary Study Area, and **would not have a substantial adverse effect**, when compared to Existing Conditions.

It is acknowledged that population growth may occur within Glenn and Colusa counties. Growth within the counties is planned and guided in the two counties' General Plans, and structures that are constructed to accommodate such growth are expected to be constructed in suitable areas to applicable and appropriate seismic standards. Therefore, growth would not affect these seismic phenomena, and the phenomena are not expected to affect growth within the counties. Consequently, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Seis-2: Inundation by Seiches or Tsunamis

If the No Project/No Action Alternative is implemented, the Project would not be completed. Therefore, there would be no increase in the risk of inundation by seiches or tsunamis to people or structures in the Primary Study Area from Project facilities. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions**.** Population growth may occur within Glenn and Colusa counties. Neither county is located on the coast; therefore, a seiche or tsunami would not occur there, **and would not have a substantial adverse effect** on additional people who may move into those counties in the future, when compared to Existing Conditions.

Impact Seis-3: Reservoir-Induced Seismicity

If the No Project/No Action Alternative is implemented, the Project would not be completed. Therefore, there would be no increase in the risk of reservoir-induced seismicity in the Primary Study Area. Projects and programs that are included in the No Project/No Action Alternative are not located within Glenn or Colusa counties, so they would not cause reservoir-induced seismicity in those counties. In addition, population growth and associated urban/suburban/rural development that may occur within the two counties in the future is expected to not affect reservoirs located within the counties. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions**.**

17.3.6 Impacts Associated with Alternative A

17.3.6.1 Extended and Secondary Study Areas – Alternative A

<u>Construction, Operation, and Maintenance Impacts</u>

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Pump Installation at the Red Bluff Pumping Plant, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides

With the exception of installing an additional pump at the RBPP, no Project facilities would be constructed, operated, or maintained in the Extended or Secondary study areas. When compared to Existing Conditions and the No Project/No Action Alternative, Project facilities would not expose people or structures to fault rupture, seismic ground shaking, seismic-related ground failure, liquefaction, or landslides. Similarly, those seismic events, if they occurred, would not affect Project facilities because most facilities would not be developed within those areas. The installation of a pump within the existing RBPP would not affect and is not expected to be affected by seismic events. There would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, the continued operation of San Luis Reservoir, Shasta Lake, Lake Oroville, and Folsom Lake would not cause these seismic events, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Seis-2: Inundation by Seiches or Tsunamis

Because no Project facilities would be constructed, operated, or maintained in the Extended or Secondary study areas (other than one pump to be installed at the existing RBPP), Project facilities would not be affected by seiches or tsunamis, if they were to occur there, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative. The installation of a pump within the existing RBPP would not affect and is not expected to be affected by a tsunami because the RBPP is not located in a coastal area, and it would not be affected by a seiche because it is not located on a waterbody. The continued operation of San Luis Reservoir would have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative, on tsunamis because the reservoir is not located in a coastal area. During the continued operation of San Luis Reservoir, Shasta Lake, Lake Oroville, and Folsom Lake, it is possible that a large earthquake-induced landslide could cause a seiche on these reservoirs. However, the seiche would be small to moderate, resulting in a **less-than-significant impact** when compared to Existing Conditions or the No Project/No Action Alternative**.**

Impact Seis-3: Reservoir-Induced Seismicity

The only examples of suspected reservoir-induced seismicity associated with existing State and federal reservoirs located within the Extended and Secondary Study Areas occurred over 35 years ago (San Luis Reservoir, 1969 and Lake Oroville, 1975). Major State and federal reservoirs within the Extended and Secondary study areas (Shasta, Folsom, San Luis and Oroville) have been operated according to established engineering guidelines since their completion in 1945 (Shasta), 1956 (Folsom), 1967 (San Luis) and 1968 (Oroville) and will continue to operate according to these same guidelines in the future. The continued absence of reservoir-induced seismicity that has characterized the past 35 to 70 years of operation of these very large reservoirs should be anticipated in the future resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, the addition of one pump to an existing bay at the RBPP would not cause or be affected by reservoir-induced seismicity because the RBPP is not located near or on a reservoir, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

17.3.6.2 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides

There are very few seismic hazard areas within the Primary Study Area. No active faults are known to be present within or immediately adjacent to the Primary Study Area, and there is low risk of fault failure (CGS, 2003a). Because there are few active faults in proximity to the Primary Study Area, the likelihood of fault rupture, strong seismic ground shaking and seismic-related liquefaction or landslides is also low. Detailed site-specific geologic and foundation investigations were used to develop design criteria to withstand reasonably probable seismic events.

The Phase II Fault and Seismic Hazards Investigation for the NODOS Integrated Storage Investigations (William Lettis & Associates, Inc., 2002) concluded that a three- to eight-inch fault slippage could occur along the northeast-striking GG-1, GG-2, GG-3, and S-2 faults that are located beneath the Project damsites or in proximity to them. DSOD would require that the design specifications be sufficient to mitigate an impact related to this slippage. Therefore, constructing, operating, and maintaining the Project facilities in this area would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project construction would involve creating high-angle temporary slopes at damsites, quarry areas, new roads, recreation areas, and temporary and permanent access roads. Project construction would also include trenching along the Delevan Pipeline. Localized slumping (i.e., landslides or trench wall failure) and liquefaction due to seismic shaking would pose a moderate threat, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation, increased soil moisture and reservoir surface level fluctuations along the shores of Sites Reservoir could exacerbate slope instability (particularly along the eastern shoreline west of Logan Ridge) and increase earthquake-induced landslide potential. Therefore, operation of the Project in this area would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Seis-2: Inundation by Seiches or Tsunamis

The Primary Study Area is not located in a coastal area. Therefore, significant hazards due to earthquake-tsunamis (seismic sea waves) are negligible. It is possible that a large earthquake-induced landslide could cause a seiche on Sites Reservoir, but the seiche would be small to moderate and would result in a

less-than-significant impact, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Seis-3: Reservoir-Induced Seismicity

Alternative A proposes a 1.27-MAF Sites Reservoir, with a maximum depth of approximately 220 feet. Reservoirs are classified as deep (80 meters, 263 feet) to very deep (deeper than 150 meters, 492 feet). Sites Reservoir would be classified as a less than deep reservoir. Deep and very deep reservoirs account for the majority of reported examples of reservoir-induced seismicity (USGS, 1996b). Therefore, potential effects from reservoir-induced seismicity caused by Sites Reservoir would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

The smaller Holthouse Reservoir and TRR would be too shallow to create reservoir-induced seismicity, and would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

17.3.7 Impacts Associated with Alternative B

17.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to seismic conditions (**Impact Seis-1**), seiches or tsunamis (**Impact Seis-2**), and reservoir-induced seismicity (**Impact Seis-3**), would be the same as described for Alternative A for the Extended and Secondary study areas.

17.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to seismic conditions (**Impact Seis-1**) and seiches or tsunamis (**Impact Seis-2**), would be the same as described for Alternative A for all Primary Study Area Project facilities.

The impacts associated with Alternative B, as they relate to reservoir-induced seismicity (**Impact Seis-3**), would be the same as described for Alternative A for all Primary Study Area Project facilities, with the exception of Sites Reservoir. Alternative B includes a 1.81-MAF Sites Reservoir, compared to the 1.27-MAF Sites Reservoir evaluated for Alternative A. The potential impacts of the larger reservoir on reservoir-induced seismicity are discussed below.

Sites Reservoir Inundation Area

Impact Seis-3: Reservoir-Induced Seismicity

The Alternative B 1.81-MAF Sites Reservoir would have a maximum depth of approximately 260 feet, which is on the threshold of classifying it as a deep reservoir. However, the Alternative B Sites Reservoir would still be classified as a less than deep reservoir. Deep and very deep reservoirs account for the majority of reported examples of reservoir-induced seismicity (USGS, 1996b). Therefore, potential effects from reservoir-induced seismicity would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

17.3.8 Impacts Associated with Alternative C

17.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to seismic conditions (**Impact Seis-1**), seiches or tsunamis (**Impact Seis-2**), and reservoir-induced seismicity (**Impact Seis-3**), would be the same as described for Alternative A for the Extended and Secondary study areas.

17.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to seismic conditions (**Impact Seis-1**) and seiches or tsunamis (**Impact Seis-2**), would be the same as described for Alternative A for all Primary Study Area Project facilities.

The impacts associated with Alternative C, as they relate to reservoir-induced seismicity (**Impact Seis-3**), would be the same as described for Alternative A for all Primary Study Area Project facilities, with the exception of Sites Reservoir. Alternatives B and C include a 1.81-MAF Sites Reservoir. Therefore, the impacts associated with the Alternative C Sites Reservoir, as related to reservoir-induced seismicity (**Impact Seis-3**), would be the same as described for Alternative B for Sites Reservoir.

17.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 17-5 for the impacts that have been identified as significant or potentially significant.

Table 17-5
Summary of Mitigation Measures for
NODOS Project Impacts to/from Faults and Seismicity

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Seis-1: Exposure of People or Structures to Fault Rupture, Seismic Ground Shaking, Seismic-Related Ground Failure, Liquefaction, or Landslides	Road Relocations, Recreation Areas, Delevan Pipeline, Quarry Areas, All Project Damsites	Potentially Significant	Mitigation Measure Seis-1: Implement Slope Stabilization Methods; Design Facilities to Withstand Fault Rupture, Seismic Ground Shaking, and Ground Failure, and Liquefaction	Less than Significant

Note:
LOS = Level of Significance

To mitigate **Impact Seis-1**, implement **Mitigation Measure Seis-1**, as follows:

Mitigation Measure Seis-1: Implement Slope Stabilization Methods; Design Facilities to Withstand Fault Rupture, Seismic Ground Shaking, and Ground Failure, and Liquefaction

- The two main Project dams would be located on a fault. To minimize potential seismic-related Project impacts, the Project design includes features such as wide clay cores and additional filter material to reduce the risk of dam failure. In addition, temporary and permanent excavation cut slopes shall be designed to be stable. If slope instability is detected, excavation cut slopes shall be stabilized by flattening, installing engineered retaining structures, and/or providing appropriate drainage elements. Shoring shall be used to support vertical trench walls. Re-sloping or removal is the most common method of landslide or slope stabilization. Structural solutions are as listed. The proposed dams, dikes, and powerplants shall be designed to survive fault rupture, seismic ground shaking and ground failure, and liquefaction without loss of the reservoir or catastrophic damage. These hazards are of far less concern during construction when there is no potential for an uncontrolled reservoir release. Additionally, the probability of these hazards occurring during the relatively short Project construction period is remote, and steps to mitigate for them are not typically included in the design of a temporary structure. Construction mitigation would normally include excavating stable cutslopes and locating staging areas away from steep slopes or areas of suspected liquefiable soils or ground rupture. Dewatering may be required for temporary excavation cutslopes and shored or un-shored trenches (CGS, 2008b). During Project operation, landslide mitigation shall include adding earth or rock buttresses at the toes of potential slope failures following best management practices (BMPs) (USGS, 2000). Additionally, restraining walls, piles, caissons, rock anchors, or geotextiles shall be used to prevent or control slope movement.

Implementation of **Mitigation** Measure **Seis-1** would reduce the level of significance of Project impacts to/from faults and seismicity to **less than significant**.

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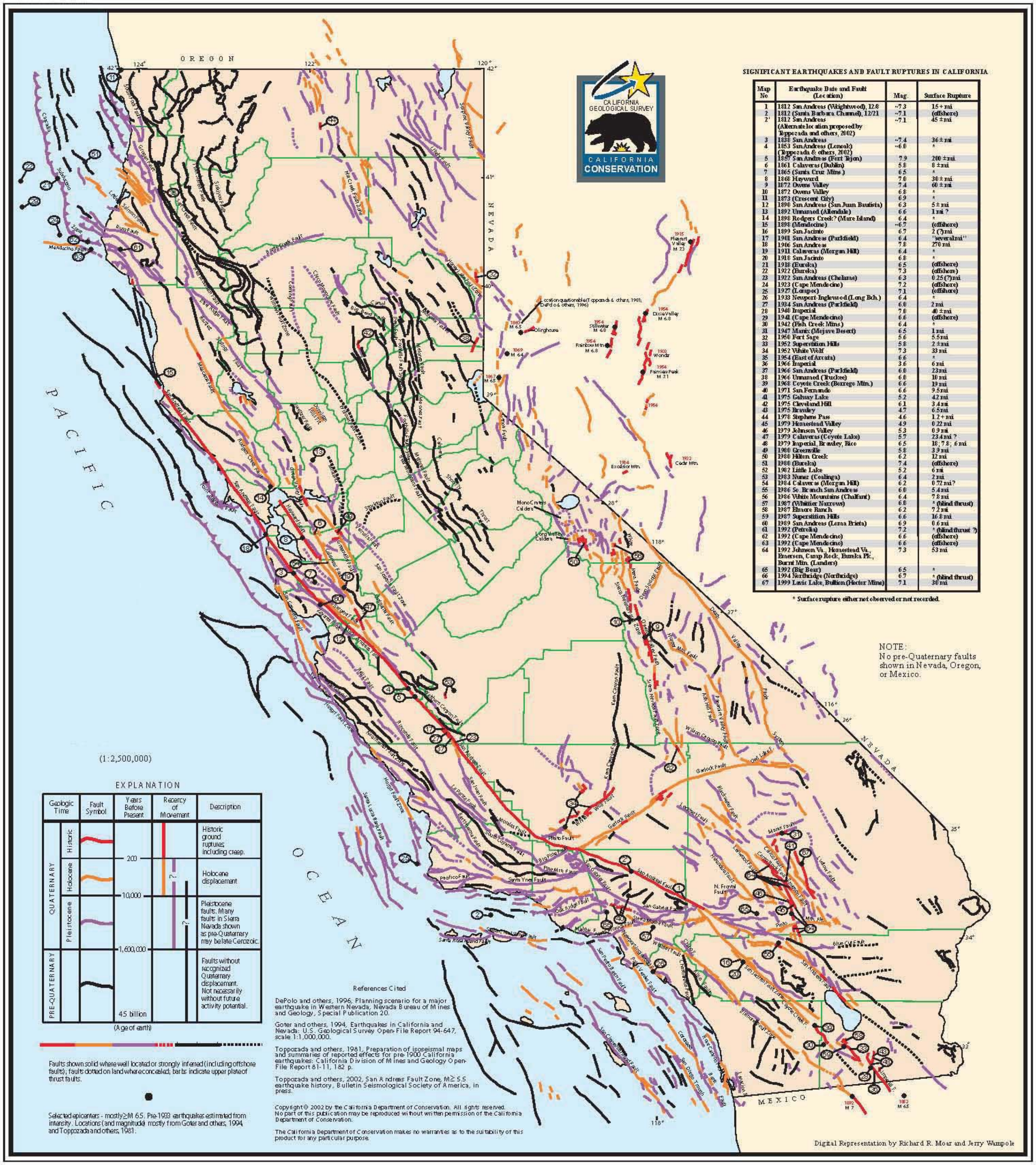
Figures



Map No	Earthquake Date and Fault (Location)	Mag.	Surface Rupture
1	1812 San Andreas (Wrightwood), 12/8	~7.3	15+ mi
2	1812 (Santa Barbara Channel), 12/21	~7.1	(offshore)
2'	1812 San Andreas (Alternate location proposed by Toppozada and others, 2002)	~7.1	45 ± mi
3	1838 San Andreas	~7.4	36 ± mi
4	1853 San Andreas (Lonoak) (Toppozada & others, 2002)	~6.0	*
5	1857 San Andreas (Fort Tejon)	7.9	200 ± mi
6	1861 Calaveras (Dublin)	5.8	8 ± mi
7	1865 (Santa Cruz Mtns.)	6.5	*
8	1868 Hayward	7.0	30 ± mi
9	1872 Owens Valley	7.4	60 ± mi
10	1872 Owens Valley	6.8	*
11	1873 (Crescent City)	6.9	*
12	1890 San Andreas (San Juan Bautista)	6.3	5 ± mi
13	1892 Unnamed (Allendale)	6.6	1 mi ?
14	1898 Rodgers Creek? (Mare Island)	6.4	*
15	1898 (Mendocino)	~6.7	(offshore)
16	1899 San Jacinto	6.7	2 (?) mi
17	1901 San Andreas (Parkfield)	6.4	"several mi"
18	1906 San Andreas	7.8	270 mi
19	1911 Calaveras (Morgan Hill)	6.4	*
20	1918 San Jacinto	6.8	*
21	1918 (Eureka)	6.5	(offshore)
22	1922 (Eureka)	7.3	(offshore)
23	1922 San Andreas (Cholame)	6.3	0.25 (?) mi
24	1923 (Cape Mendocino)	7.2	(offshore)
25	1927 (Lompoc)	7.1	(offshore)
26	1933 Newport-Inglewood (Long Bch.)	6.4	*
27	1934 San Andreas (Parkfield)	6.0	2 mi
28	1940 Imperial	7.0	40 ± mi
29	1941 (Cape Mendocino)	6.6	(offshore)
30	1942 (Fish Creek Mtns.)	6.4	*
31	1947 Manix (Mojave Desert)	6.5	1 mi
32	1950 Fort Sage	5.6	5.5 mi
33	1952 Superstition Hills	5.8	2 ± mi
34	1952 White Wolf	7.3	33 mi
35	1954 (East of Arcata)	6.6	*
36	1966 Imperial	3.6	6 mi
37	1966 San Andreas (Parkfield)	6.0	23 mi
38	1966 Unnamed (Truckee)	6.0	10 mi
39	1968 Coyote Creek (Borrego Mtn.)	6.6	19 mi
40	1971 San Fernando	6.6	9.5 mi
41	1975 Galway Lake	5.2	4.2 mi
42	1975 Cleveland Hill	6.1	3.4 mi
43	1975 Brawley	4.7	6.5 mi
44	1978 Stephens Pass	4.6	1.2+ mi
45	1979 Homestead Valley	4.9	0.22 mi
46	1979 Johnson Valley	5.3	0.9 mi
47	1979 Calaveras (Coyote Lake)	5.7	23.4 mi ?
48	1979 Imperial, Brawley, Rico	6.5	18; 7.8; .6 mi
49	1980 Greenville	5.8	3.9 mi
50	1980 Hilton Creek	6.2	12 mi
51	1980 (Eureka)	7.4	(offshore)
52	1982 Little Lake	5.2	6 mi
53	1983 Nunez (Coalinga)	6.4	2 mi
54	1984 Calaveras (Morgan Hill)	6.2	0.72 mi?
55	1986 So. Branch San Andreas	6.0	5.4 mi
56	1986 White Mountains (Chalfant)	6.4	7.8 mi
57	1987 (Whittier Narrows)	6.0	* (blind thrust)
58	1987 Elmore Ranch	6.2	7.2 mi
59	1987 Superstition Hills	6.6	16.8 mi
60	1989 San Andreas (Loma Prieta)	6.9	0.6 mi
61	1992 (Petrolia)	7.2	* (blind thrust ?)
62	1992 (Cape Mendocino)	6.6	(offshore)
63	1992 (Cape Mendocino)	6.6	(offshore)
64	1992 Johnson Va., Homestead Va., Emerson, Camp Rock, Eureka Pk., Burnt Mtn. (Landers)	7.3	53 mi
65	1992 (Big Bear)	6.5	*
66	1994 Northridge (Northridge)	6.7	* (blind thrust)
67	1999 Lavic Lake, Bullion (Hector Mine)	7.1	30 mi

* Surface rupture either not observed or not recorded.

Compiled by Charles W. Jennings and George J. Saucedo
1999 (Revised 2002, Tousson Toppozada and David Branum)

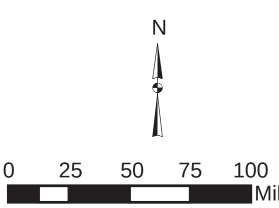
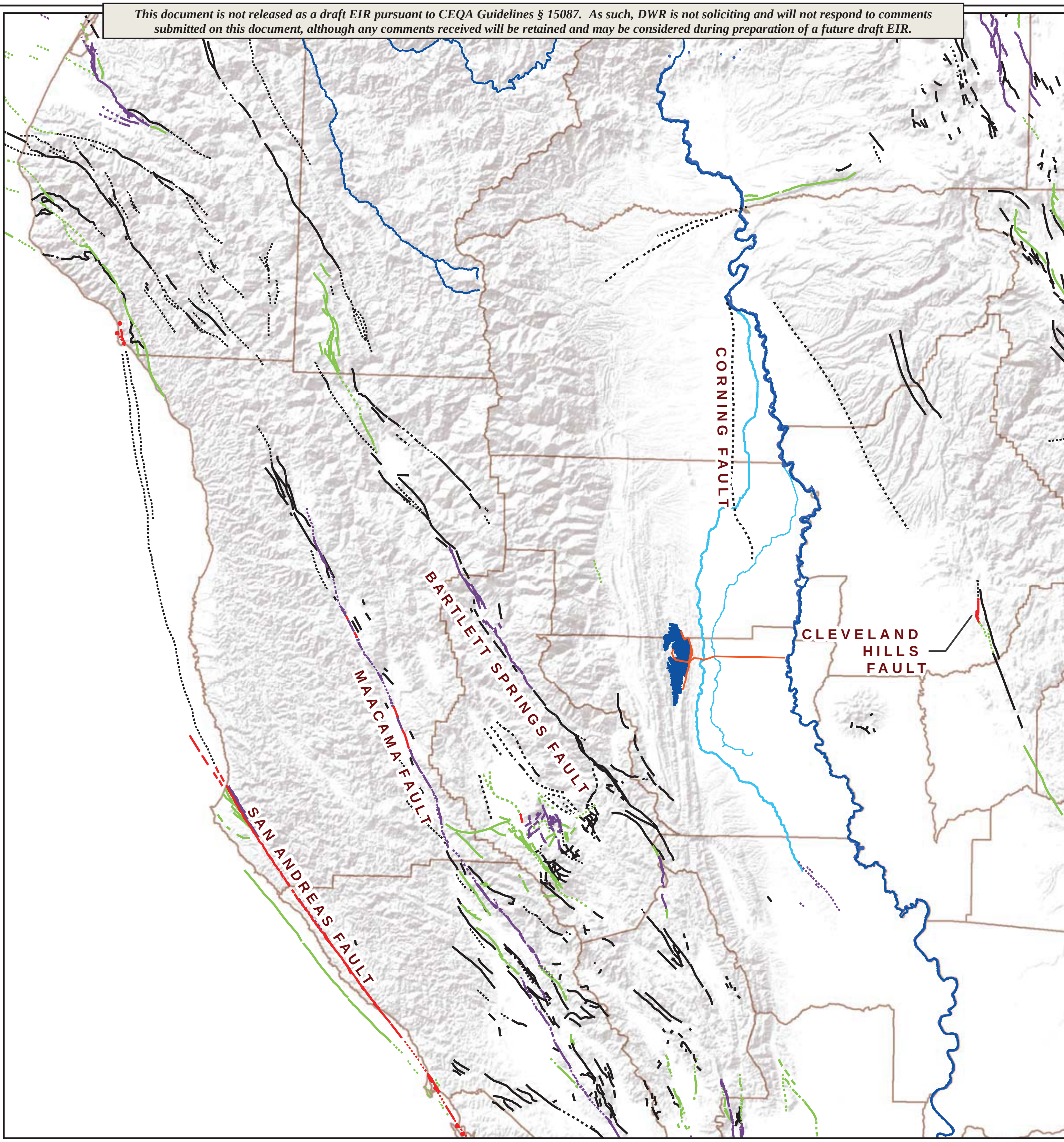


FIGURE 17-1
Simplified Fault Activity in California
North-of-the Delta Offstream Storage Project



Legend

QuaternaryFaults

- Historic Displacement (Last 200 Years)
- Holocene Displacement (Last 11,000 Years)
- Late Quarternary Displacement (Last 750,000 years)
- Undivided Quarternary Displacement (Last 1,600,000 Years)
- Delevan Transmission Line
- Rivers
- Canal
- Proposed Sites Reservoir
- County Boundary

FIGURE 17-2
Regional Faults
North-of-the-Delta Offstream Storage Project

N

0 5 10 20 30 40 50 Miles

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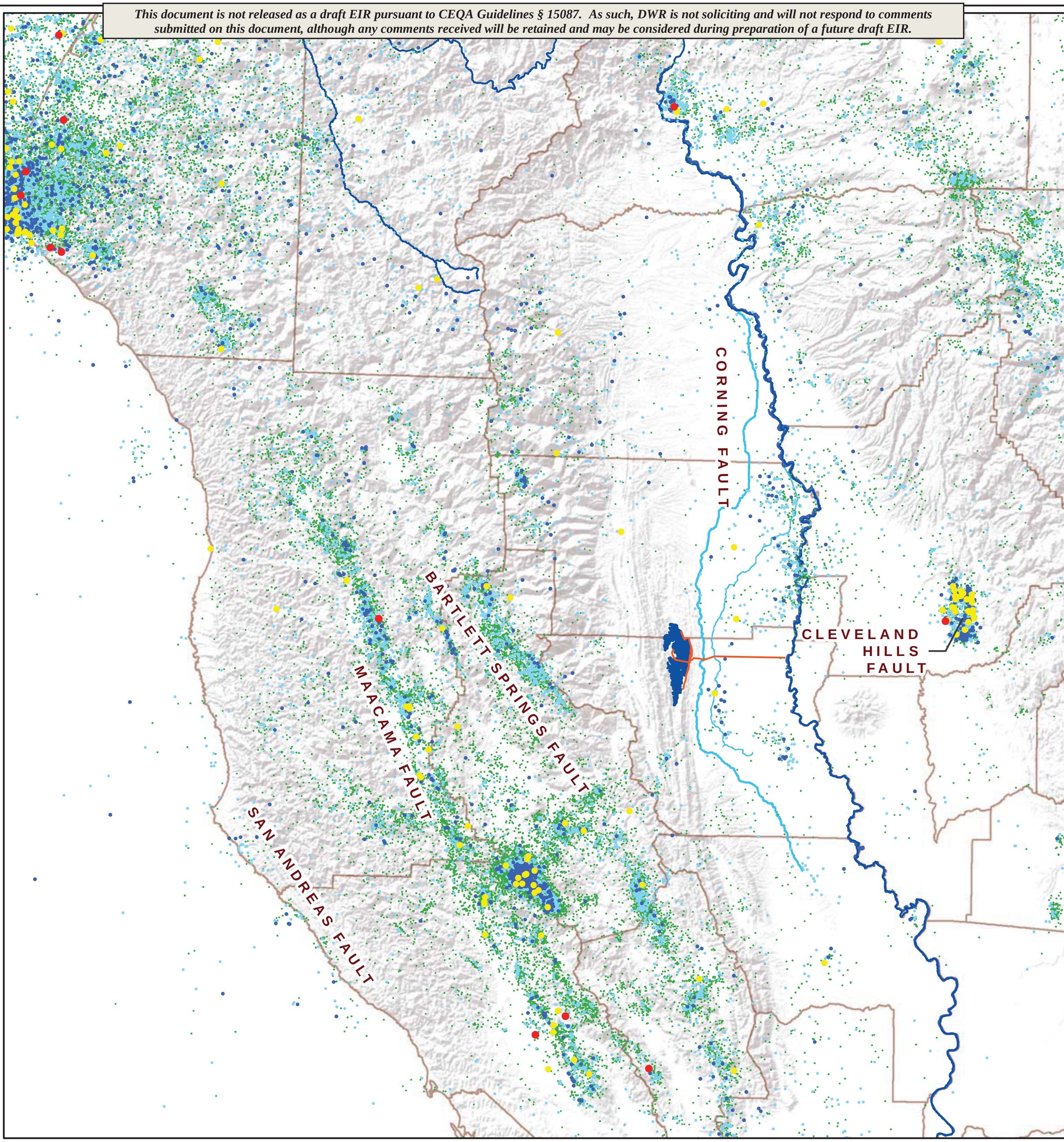

Legend

Earthquake Epicenters

Magnitude

- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6

- Delevan Transmission Line
- Rivers
- Canal
- Proposed Sites Reservoir
- County Boundary

FIGURE 17-3
Regional Seismicity

North-of-the-Delta Offstream Storage Project

N

0 5 10 20 30 40 50 Miles

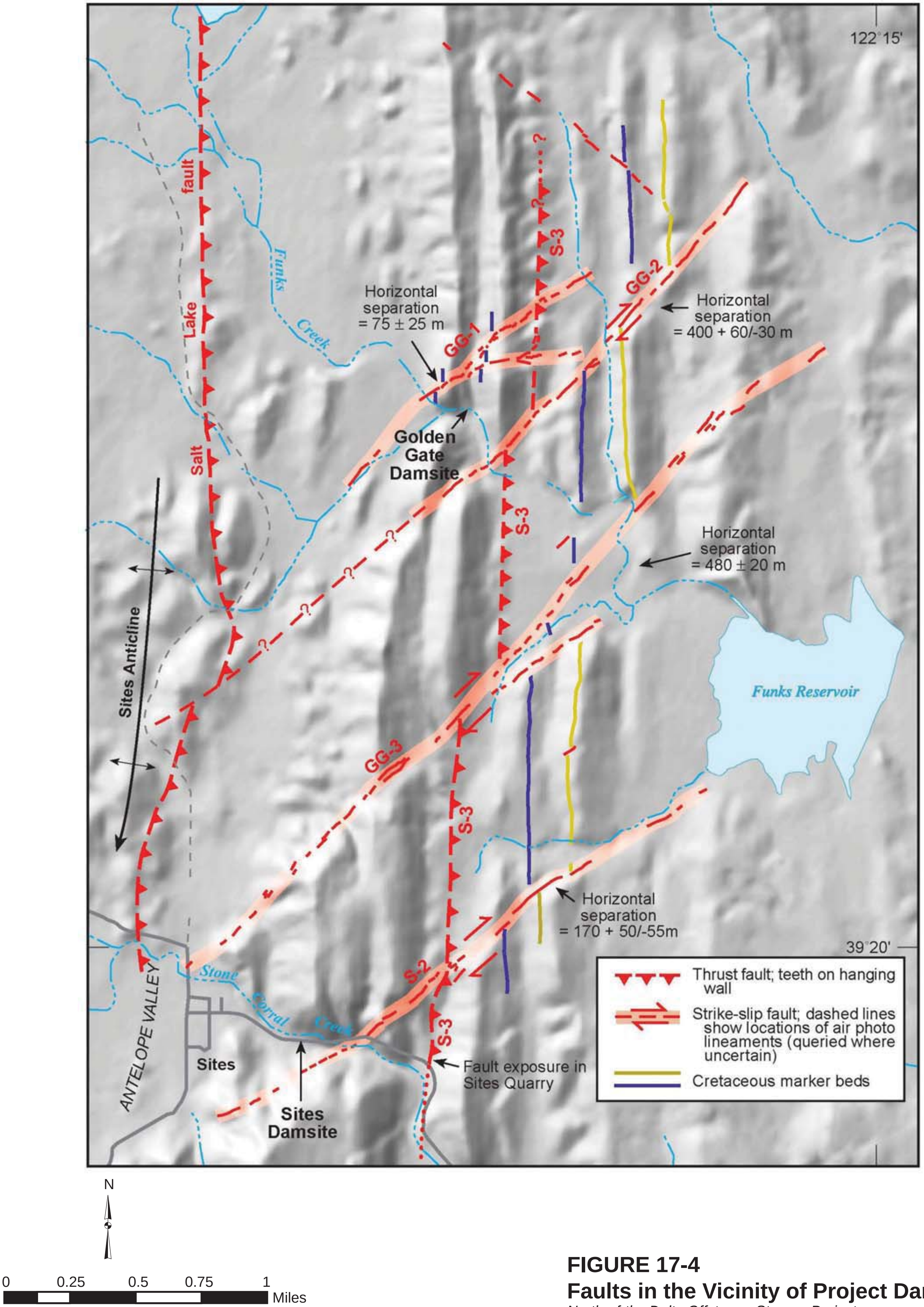

FIGURE 17-4
Faults in the Vicinity of Project Damsites
North-of-the Delta Offstream Storage Project

18. Cultural Resources

18.1 Introduction

This chapter describes the cultural resources setting for the Extended, Secondary, and Primary study areas. Cultural resources are sites, buildings, structures, objects, and districts that may have traditional or cultural value. This broad range of resources includes archaeological sites that reflect the prehistoric and historic-era past; historic-era resources, such as buildings and structures; landscapes and districts; and traditional cultural properties (TCPs), i.e., those resources that are historically rooted in a community's beliefs, customs, and practices. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for cultural resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

18.2 Affected Environment

18.2.1 Extended Study Area

18.2.1.1 Prehistoric Context

Archaeologists study the physical evidence of past human behavior called "material culture[1];" they look for changes in material culture over time and across geographic regions to reconstruct the past. Change occurs in material culture because the culture of a single group of people has evolved in place due to environmental factors, population changes that include socioeconomic dynamics within the group, or influences from "outside" populations. There is evidence that neighboring populations shared ideas that are reflected by material culture traits. In some cases, a culture was replaced by a new group of people who arrived with artifacts that reflected their unique culture.

Archaeological evidence currently indicates that people arrived in California around 13,000 years ago. Engaged in the hunting of large game and gathering of plant foods, these early nomadic groups entered the region not only by land, but also by sea, following the coastline in boats (Moratto and Chartkoff, 2007). There is a minimal record of the earliest inhabitants, and their presence is demonstrated mainly by sparse remains of large stone spear points with a characteristic groove or "flute" sometimes associated with the fossilized remains of extinct animals (Negrini et al., 2006). Subsistence practices evolved over time from nomadic hunting and gathering to increased sedentism[2] with greater intensification of resource exploitation. This was paired with changes in technology, such as relinquishing the hunting spear for the

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[1] Material culture refers to artifacts or other items that reflect a group's culture. Examples of material culture include, but are not limited to, items such as tools of flaked stone (e.g., arrowheads, scrapers), pottery, bone fish hooks, and shell beads.

[2] Sedentism refers to more permanent year-round settlement as opposed to a nomadic existence.

bow and arrow, and exchanging handstones and millingstones[3] for mortars and pestles. Although these changes generally occurred universally throughout the Extended Study Area, they did not all occur everywhere at the same time; thus the mortar and pestle are known in the San Francisco Bay Area by 6000 years before present (B.P.) (Milliken et al., 2007), but they don't appear in the Sierra Nevada until approximately 2500 B.P. (Hull, 2007).

The indigenous population grew as sedentism increased and resource availability stabilized, and as subsequent waves of migrants continued to arrive in the state; thereby leaving increased evidence (i.e., material culture) of human activity and changing human behavior. Gradual at first, growth among California's native populations became rapid in the period just prior to European incursion. As a result, evidence of past human activity, i.e., the "archaeological record," became progressively more complex. When systematic archaeological research began in California in the late 19th century, archaeologists began organizing the archaeological record into cultural stages to develop a chronological sequence, or "culture history," of California.

These cultural histories were developed regionally and archaeologists have produced a number of culture chronologies, using regionally specific nomenclature, across California. California has eight identified archaeological regions: the North Coast, Northeastern, Central Valley, Sierra Nevada, San Francisco Bay, Central Coast, Southern Coast, and Desert regions (Moratto, 1984). The regions, in turn, are divided into numerous subregions (Figure 18-1). The prehistoric context for the Extended Study Area includes portions of all of these regions. Within these regions, various chronologies attempt to account for changes in the archaeological record as a result of inferred changing human behavior. The archaeological record in California, therefore, reflects some shared broad-based patterns, but it also exhibits locally expressed culture traits. The numerous indigenous groups who arrived into the region now referred to as California were linguistically diverse, and they further distinguished themselves from their neighbors by developing cultural traits unique to their communities.

Fredrickson (cf. 1994) adapted Willey and Phillips' (1958) terminology for California and defined the following periods of culture development: the Paleo-Indian Period, followed by the Lower Archaic, Middle Archaic, Upper Archaic, Lower Emergent, and Upper Emergent periods. These concepts identify changes in resource procurement and social complexity over time and are often related to regionally broad patterns of culture that are reflected by the presence of similar artifact types. Other researchers also often identify these archaeological horizons according to the geological time scale and are, therefore, referred to as the Late Pleistocene, and early, middle, and late Holocene cultures.

As previously mentioned, although the various archaeological regions developed specific cultural traits, the prehistories of all of the regions reflect a similar progression of technological changes and social complexity over time. The broad periods defined by Fredrickson (cf. 1994) (the Paleo-Indian Period; the Lower, Middle, and Upper Archaic periods; and Lower and Upper Emergent periods) are applicable to all of the archaeological regions in the Extended Study Area; though to differing degrees. More detailed information about these stages is presented below in Section 18.2.1.3 under the Prehistoric Context for the Primary Study Area. Although the discussion focuses on the Primary Study Area, the general characteristics of the periods can be related to all of California prehistory.

[3] Handstones and millingstones are stone tools most often associated with the grinding of seeds. As the name implies, the handstone can be held in the hand. It has a generally flat surface that is rubbed across a similarly flat base, which is the millingstone.

18.2.1.2 Ethnographic Context

The indigenous peoples of California were extremely diverse and populous when Europeans first began to colonize the state. This diversity is reflected in the large number of mutually unintelligible languages that have been identified. At least 64, and possible as many as 80, languages were spoken (Shipley, 1978). These different languages essentially translate to individual tribes or tribelets. Although many ethnographic groups shared cultural traits based on geographic location and available resources, each also had unique expressions of culture.

The Extended Study Area overlaps portions of 32 identified Native American tribal groups in California (Figure 18-2) (Kroeber 1925: Plate 1). As with all California Indians, these groups subsisted by hunting and gathering. Coastal groups relied heavily on marine food resources, such as fish, shellfish, and marine mammals, as well as terrestrial resources, while interior groups relied primarily on terrestrial resources for shelter and subsistence. The Native populations were decimated by disease, loss of subsistence habitat, and genocide during the early years of colonization by Europeans and Euro-Americans. However, during the late 19th and early 20th centuries, ethnographers identified many viable Native communities surviving throughout California, including the Extended Study Area.

The territorial boundaries delineated by early ethnographers for Native California groups have varied over time and are often poorly defined. In addition, many tribal boundaries overlapped. The boundaries should not be considered fixed, but reflect general areas in which Native American groups resided. Most groups migrated within these general boundaries throughout the year. The Native California tribes affiliated with the Extended Study Area (and the Secondary Study Area and Primary Study Area, below) are depicted in Figure 18-2.

18.2.1.3 Historic-Era Context

The initiation of the historic era varied by region throughout California, but generally it began between the mid-1500s and mid-1800s. Historic-era cultural activities provide a record of Spanish, Mexican, and American rule, occupation, and land use. An abbreviated history is presented to provide a background of the presence, chronological significance, and historical relationship of cultural resources within the Extended Study Area.

The earliest explorations of California by Europeans were by sea. Portuguese captain Juan Rodriquez Cabrillo landed in the vicinity of San Diego in 1542. He also toured the Channel Islands before heading up the coast along the length of the State. He was followed by Sir Francis Drake in 1579 and Sebastian Viscano in 1602. None of these first explorers established settlements or had extensive interactions with Native Californians.

During the Spanish Period (1769 to 1822), the Spanish government established a series of presidios, missions, and towns along the Alta California (New Spain) coast, from San Diego to San Francisco. The Spanish colonized the local Native Americans along the way. Despite Spanish occupation, however, California remained largely unsettled throughout this period. The routes used to travel between the presidios and missions provided the outline for today’s U.S. 101 and I-5 (Kyle et al., 2002).

The Mexican people took New Spain back from the Spanish in 1822, and renamed it the Republic of Mexico, thus beginning the Mexican Period (1822 to 1848). During this time, the Catholic missions were secularized, and the Indians were left to fend for themselves. Large land grants, also known as ranchos, were given to loyal Californios[4]. Many governments ruled or vied for power over California during this time. This unrest lured outsiders who were seeking to take advantage of California's abundant resources. As more settlers arrived, relations between Mexico and the United States grew tense, ultimately resulting in war in 1846. California was formally annexed to the United States by the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican-American War (Kyle et al., 2002).

The end of the Mexican-American War and the discovery of gold marked the beginning of the American Period (1848 to present). This discovery drew many people into California, caused a significant increase in the local non-native population and, in turn, decimated the indigenous population. Sacramento, San Francisco, Stockton, and many other cities grew from small settlements to "boom" towns, and roads, churches, schools, and other towns were built throughout the State. The American Civil War took place from 1861 to 1865, and although California's involvement was minimal, construction of the railroad may have been the most important immediate effect of the Civil War on California. Easy access to rail lines made citrus growing and other large-scale agricultural pursuits an important element in the State's economy. The creation of a government and a system of laws led to the admission of California as a free state in 1850 (Kyle et al., 2002).

18.2.1.4 Cultural Resources

Prehistoric Resources

Prehistoric resources are the material remains of human activities that predate contact with non-Native Americans. Prehistoric resources in the Extended Study Area may include habitation or village sites, temporary campsites, roasting pits/hearths, burials, bedrock milling features, lithic scatters, rock art, rock features (such as hunting blinds), and isolated artifacts.

Prehistoric resources have been found in many ecosystems and terrains, including river and stream drainages, and coastal strips, which are often prime locations for Native American village sites and processing camps. They are found in valleys, hills, mountains, deserts, grasslands, and forests, particularly adjacent water courses. Previous archaeological work indicates that areas within the Extended Study Area, such as Lake Almanor, San Luis Reservoir, New Melones Reservoir, and Castaic Lake, may be particularly sensitive for cultural resources, as opposed to areas, such as the plains of the Central Valley, where fewer resources have been recorded.

Ethnographic Resources

Ethnographic resources in the Extended Study Area may include known village sites, ceremonial sites, plant gathering locations, and hunting or fishing areas. Similar to prehistoric resources, ethnographic resources are likely to occur in the same types of areas, such as river and stream drainages and coastal strips, and within the same project components. The projects within the Extended Study Area where ethnographic resources may occur include, but are not limited to, Lake Almanor, New Melones Reservoir, and Castaic Lake.

Historic-Era Resources

Historic-era resources are physical sites, structures, or built features that coincide with the advent of written records. These resources include both historic-era archaeological sites and architectural structures.

[4] A term used to describe the Spanish-speaking people who moved into California and colonized the state during the Spanish and Mexican periods (1769 to 1848).

Historic-era resources within the Extended Study Area may include town sites, homesteads, ranches, privy pits, dumps, mining remains, transportation facilities, water conveyance systems, resource extraction facilities (such as quarries), and ranches and associated facilities. Architectural structures refer primarily to buildings and structures, such as bridges. Historic-era resources often occur in the same places as prehistoric sites, because these were the desirable locations for human settlement that provided food, shelter, and other necessary resources. Areas within the Extended Study Area that are particularly sensitive for historic-era resources include Lake Almanor, New Melones Reservoir, and more generally, the Sierra Nevada foothills.

Traditional Cultural Properties

TCPs within the Extended Study Area may include archaeological or ethnographic sites, geographical locations, or features that are associated with the cultural practices or beliefs of a living community that are rooted in that community's history, and are essential in maintaining the continuing cultural identity of the community. TCPs are most often associated with Native American practices and beliefs; however, other communities or cultural groups may acknowledge similar properties. TCPs can occur in any type of location, but tend to be located in proximity to prehistoric and ethnographic resources such as habitation sites. Similar to the archaeological and ethnographic resources listed above, TCPs would be expected in the vicinity of Lake Almanor, San Luis Reservoir, New Melones Reservoir, and Castaic Lake, although they could be situated anywhere within the Extended Study Area.

18.2.2 Secondary Study Area

18.2.2.1 Prehistoric Context

The prehistoric context for the Secondary Study Area contains six of the California archaeological regions (the North Coast, Northeastern, Central Valley, Sierra Nevada, San Francisco Bay, and Central Coast regions) and their subregions (Figure 18-1); all found in the northern portion of the State.

18.2.2.2 Ethnographic Context

The Secondary Study Area covers a large area that overlaps 13 of the identified Native American tribal groups in California (Figure 18-2). These ethnographic groups included the Yurok, Hupa, Chimariko, and Wintu in the extreme northern part of the Secondary Study Area; the Yana, Nomlaki, Konkow, Patwin, Nisenan, Plains Miwok and Bay Miwok tribal groups within the central portion of the Secondary Study Area; and the Coast Miwok, Bay Miwok Patwin, and Costanoan around the San Francisco Bay.

18.2.2.3 Historic-Era Context

The historic-era context for the Secondary Study Area is the same as that described for the Extended Study Area. Information on the historic-era context is presented in the Extended Study Area discussion.

18.2.2.4 Cultural Resources

Prehistoric Resources

The potential prehistoric resources in the Secondary Study Area are identical to those in the Extended Study Area: habitation or village sites, temporary campsites, roasting pits/hearths, burials, bedrock milling features, lithic scatters, rock art, rock features (such as hunting blinds), and isolated artifacts. Prehistoric resources within the Secondary Study Area are more likely to cluster around the watersheds of the Trinity, American, Sacramento, and Feather rivers, as well as the Bay/Delta region. Conversely, prehistoric resources within the plains of the central Sacramento Valley are likely to be less prevalent.

Ethnographic Resources

Ethnographic resources in the Secondary Study Area are the same as those in the Extended Study area, and may include known village sites, ceremonial sites, plant gathering locations, and hunting or fishing areas. Ethnographic resources are likely to cluster around the same locations as prehistoric resources, including the Trinity, American, Sacramento, and Feather rivers, Shasta Lake, Lake Oroville, and Folsom Lake, as well as the Bay/Delta region.

Historic-Era Resources

Similar to the Extended Study Area, historic-era resources within the Secondary Study Area may include town sites, structures, transportation facilities, water conveyance systems, resource extraction facilities (such as quarries), ranches and associated facilities, homesteads, privy pits, and dumps. Historic-era resources often occur in the same areas as prehistoric resources because these were the desirable locations for food, shelter, and resources. Areas particularly sensitive for historic-era resources include the watersheds of the Trinity, American, Sacramento, and Feather rivers, the San Francisco Bay/Delta region, as well as the plains of the central Sacramento Valley.

Traditional Cultural Properties

Similar to the Extended Study Area, TCPs within the Secondary Study Area may include sites, locations, or features that are associated with the cultural practices or beliefs of a living community that are rooted in that community's history, and are essential in maintaining the continuing cultural identity of the community. TCPs are most often associated with Native American beliefs and practices, such as areas where natural materials are gathered to enhance the continuity of cultural traditions like basket making supplies. However, other communities or cultural groups may acknowledge similar properties. TCPs may occur anywhere, but are likely to be located in proximity to prehistoric and ethnographic resources. TCPs are known to exist around Shasta Lake and the Lake Oroville area.

18.2.3 Primary Study Area

18.2.3.1 Prehistoric Context

The prehistoric context for the Primary Study Area lies at the boundary of the North Coast and Central Valley archaeological regions (Figure 18-1), but is almost entirely within the latter region. The known archaeological record for the regions around the Primary Study Area reflects the trajectory offered by Fredrickson (cf. 1994) that was provided earlier in this chapter. White et al. (2009), as presented below, outlined five periods to describe the cultural chronology for the regions that contain the Primary Study Area: the Paleo-Indian, Early (or Lower) Archaic, Middle Archaic, Late (or Upper) Archaic, and Emergent periods.

Paleo-Indian Period

Recent sampling at Borax Lake near Clear Lake provides tentative obsidian hydration dating evidence that indicates occasional obsidian quarrying activity was occurring in northern California as early as 16,000 years ago (White et al., 2009). However, the find remains unconfirmed, and no other archaeological traces of this age have been identified in the north state. The most reliable evidence indicates that northern California was first colonized at the end of the Pleistocene Era around 12,000 years ago. Sparse data indicate that these earliest peoples were small populations of culturally conservative hunters and foragers who moved between widespread resource patches and practiced technological traditions that were similar from region to region. Their co-occurrence with Pleistocene mega-fauna is suspected, but not demonstrated. The most ancient confirmed cultural traces in northern California are associated with the Western Clovis Tradition. The Western Clovis Tradition (Willig and Aikens, 1988), dating between approximately 13,500 to 10,500 B.P., is represented by one site and a few scattered artifacts in northern California, and is marked by use of the distinctive Clovis fluted projectile point; one of which was discovered along Thomes Creek in Tehama County north of the Primary Study Area. Diet and settlement specifics are unknown at this time and remain a matter of speculation (Fredrickson, 1984; Fredrickson and White, 1988).

Early (or Lower) Archaic Period

Early Archaic cultures are represented in the Primary Study Area by the Borax Lake Pattern, which is the northern California expression of the Western Stemmed Tradition dating between approximately 10,500 to 7000 B.P. (Willig and Aikens, 1988). The characteristic artifact types that reflect human activity during the Early Archaic include wide-stemmed projectile points, as well as handstones and millingstones. Deep flute-like basal thinning, large bladelet flakes, and well worked unifacial[5] tools are carryovers from Paleo-Indian technology. A few sites have produced plant and animal remains, indicating that the Borax Lake Pattern diet featured large nuts, and small and large game. Several sites attributed to this age have been identified within the foothills of Glenn and Colusa counties.

Middle Archaic Period

Middle Archaic cultures occurred from ca. 7500 to 2500 years B.P. It is widely documented in North America, and clearly established for northern California, that the geological period of the Middle Archaic, the Middle-Holocene, was a time of climatic instability (Adam and West, 1983; Benson et al., 2002). Although generally warmer and drier than the Early Holocene climate, the Middle Holocene was also marked by significant climatic fluctuations. Two consequences have been recognized in the regional archaeological record as a result of this instability. First, the development of upland and lowland soils was affected in such a way that the capacity of the landscape to store archaeological deposits was diminished; i.e., the more arid climate of the Middle Holocene diminished erosion and siltation mechanisms that cause soil build-up that normally traps and caps archaeological deposits. This was compounded by abrupt climatic events that would cause severe erosion of any archaeological remains that were developed. Second, the density and distribution of economically significant resources also appears to have been affected by climatic and landscape instability, leading to cultural responses such as local decreases in population, interregional population movements, and dietary change. Consequently, Middle Archaic archaeology is uncommon and the available record is problematic.

Several trends in prehistoric culture change first emerged during the Middle Archaic, including the development of settlements associated with ridgetops (Hildebrandt and Hayes, 1993), rivers/marshes (Heizer, 1949), and lakesides. Dietary specializations based on the acorn, deer, and freshwater and

[5] Unifacial tools demonstrate manufacturing methods (e.g., flaking) on one face or side; alternately bifacial tools are worked on two faces or sides.

anadromous fisheries also occurred. The archetypal[6] Middle Archaic culture is the Windmiller Pattern, which was present in the Sacramento and San Joaquin valleys, the Sacramento-San Joaquin Delta, and the Mt. Diablo region. Windmiller material culture featured artifacts made of varied stone materials, such as quartz crystals, chert, slate, obsidian, asbestos, and biotite, as well as red ochre, and worked clay. Worked shell included small beads, and red and black abalone square beads and various ornament styles Twined basketry is known from impressions left in baked clay. Other baked clay objects included cooking balls, perforated disks, and grooved net sinkers (Beardsley, 1954; Heizer, 1949; Moratto, 1984). Based on the rarity of ground stone tools, the abundance of projectile points, and the presence of remains from elk, pronghorn, deer, rabbit, coyote, beaver, lynx, bear, and waterfowl, it is assumed that hunting was the focus of Windmiller Pattern subsistence (Heizer, 1949; Moratto, 1984). The Mendocino Pattern and Berkeley Pattern were the distinct regional cultural traditions within the Primary Study Area that first emerged in northern California during the Middle Archaic Period.

Late (or Upper) Archaic Period

Regional climate stabilized around 3000 B.P., and by 2500 B.P., the widespread generalized technological traditions of the Middle Archaic Period were replaced by distinct regional specializations. Archaeologists have also found evidence of an increase over time in the scope and distance of intergroup trade patterns, a widespread change from less to more complex social forms, and an increase in population density. The archetypal Late Archaic culture is the Berkeley Pattern, which reflects the basic archaic adaptation of the rich alluvial basins of central California. There was also considerable cultural diversity within the Berkeley Pattern, and local cultures have been identified from the Delta north through the central Sacramento Valley and central North Coast Ranges (Bennyhoff, 1994; White, 2003). Certain traits, however, are common to all Berkeley Pattern variants, including a highly developed bone tool industry, atlatl[7] engaging hooks, and dart-sized non-stemmed points (Beardsley, 1954; Fredrickson, 1974; Lillard et al., 1939). Berkeley Pattern sites contain many features, especially fire-cracked rock heaps, shallow hearths, rock-lined ovens, house floors, cairns[8], and graves. Complete house floors suggest that large pole-framed houses between 12 and 18 feet in diameter were built. Clay with tule or bulrush impressions indicates that the houses were thatched and sod-packed. The Berkeley Pattern economy varied regionally, and generally focused on seasonally structured resources that could be harvested and processed in bulk, such as acorns, salmon, shellfish, and deer. The high frequency of mortars and pestles relative to chipped stone implies a heavy reliance on acorn processing (Fredrickson, 1974; Moratto, 1984).

Continuing a pattern of increasing cultural diversity in central California, Berkeley Pattern sites were established during the same time period as late Windmiller Pattern sites in the northern San Joaquin Valley (Fredrickson, 1974). In the North Coast Ranges, Berkeley Pattern sites were established during the same time period as the Mendocino Pattern sites, with the Berkeley Pattern prevalent in alluvial basins and the Mendocino Pattern common to adjoining foothill and mountain terrains, suggesting different ecological niches. The Primary Study Area, at the boundary of these niches (e.g., foothill habitat in the area of Sites Reservoir and valley habitat around the Terminal Regulating Reservoir), might be expected

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[6] An archetype is the original model or type after which other similar things are patterned. The Windmiller was the original pattern identified within Central California that represented a Middle Archaic culture. Thus, analyses of other Middle Archaic cultures in Central California are compared to the Windmiller Pattern.

[7] An atlatl is a rod or stick-like device used to throw a spear; thereby giving the projectile greater velocity and force. An atlatl engaging hook, in this instance, is a carved stone hook attached to the atlatl; the spear is placed in the hook in preparation for throwing.

[8] Cairns are piles of stones, usually to mark graves.

to reveal archaeological remains that reflect elements of both the Berkeley and Mendocino patterns, with an emphasis on the latter.

Emergent Period

The relatively stable climate established at the outset of the Late Holocene continued through the modern period, although a "climatic anomaly" dating around 900 B.P. may have caused widespread disruption (comparable to the Middle Holocene) (Jones et al., 1999). In northern California, after 1100 B.P., many archaic technologies and cultural traditions disappeared in each region, and were replaced by the onset of cultural patterns and behaviors similar to those existing locally at the time of culture contact with Euro-Americans.

The archetypal Emergent Period culture is the Augustine Pattern. The Augustine Pattern is a widespread tradition that reflects the integration of long-distance trade spheres, and the introduction of the bow and arrow, which replaced the atlatl as the favored hunting implement. The Augustine Pattern has been divided into two phases common to most or all localities. Phase 1 markers include *Olivella* shell whole and lipped beads. Banjo-type abalone ornaments also first appear with Phase 1 of the Augustine Pattern, as well as elaborately incised bird bone whistles and tubes, and "flanged" soapstone pipes. Phase 2 artifacts include small corner-notched and triangular points, clam shell disk beads, bead drills, magnesite cylinders, bedrock mortars, and housepit sites often attributable to known ethnographic villages (Beardsley, 1954; Fredrickson, 1984; Moratto, 1984).

Other new traits that distinguished the Augustine Pattern include tightly flexed burials and cremation. Cremation was a form of burial apparently reserved for high status individuals during Phase 1, but was widespread during Phase 2 (Fredrickson, 1974; Moratto, 1984). Grave offerings, such as shell beads and ornaments, regularly occurred with utilitarian items, including mortars and pestles often broken before burial. In the Sacramento Valley area, fishing equipment is more common, elaborate, and diverse than in earlier phases, and includes several types of harpoons, bone fish hooks, and gorge hooks (Beardsley, 1954; Elsasser, 1978; Moratto. 1984). Basketry has been identified from charred remains found in graves, and a form of pottery is also known from sites in the Central Valley (Beardsley, 1954; Moratto, 1984). Baked clay balls, probably used for cooking, are a common constituent in Central Valley Archaeological Region sites where stone is absent (Beardsley, 1954; Moratto, 1984). The Augustine Pattern economy was regionally variable, although fishing and acorn gathering appear to have increased in importance over time. Shaped mortars and pestles predominate, with charred acorns frequently found in middens. Culture contact between Native Californians and immigrant populations from throughout the world occurred at various times in northern California. In the Sacramento Valley, contact generally occurred between 1750 and 1820.

18.2.3.2 Ethnographic Context

At the time of European contact with the Native Americans of California, the tribal groups known to have occupied the northern Sacramento Valley included the Wintu, Nomlaki, Yana, Konkow, Nisenan, and Patwin peoples. These populations settled primarily along streams and rivers and used a broad range of native plants and animals for subsistence, primarily focusing on acorns, fish, and deer. Population density in this region was one of the highest in the state.

The Primary Study Area is situated primarily within the ethnographic territory of the Hill and River Patwin and, to a lesser extent, in areas belonging to the Nomlaki, and the Konkow Maidu. Essentially all of the facilities in the Primary Study Area are located within ancestral Patwin lands. The exceptions are the northern portions of the T-C Canal and a section of the GCID Canal in Glenn County that are on lands affiliated with the Nomlaki, and a small portion of the GCID Canal south of the Glenn/Tehama County line that is in territory associated with Konkow occupation. The GCID Pumping Plant is on the border between the Nomlaki and Konkow Maidu.

Patwin

The Hill Patwin lived in the North Coast Range foothills, and the River Patwin inhabited approximately 80 miles along the Sacramento River. The Primary Study Area is at the northern limits of Patwin territory. The Patwin are linguistically classified as part of the Wintuan family of the Penutian language stock. Wintuan is separated linguistically and culturally into three major groups from north to south: the Wintu, Nomlaki, and Patwin. These three groups represent mutually-unintelligible languages. Each language was further subdivided into local dialects, differentiated into riverine and foothill zones (Shipley, 1978).

Throughout the middle and late Holocene up until European colonization, the indigenous people of northern California maintained hunting and gathering subsistence-based cultures. The absence of agriculture in the greater part of California may be linked with the efficiency of the collecting and hunting economy. Acorns were the staple food source of the Patwin, and were used in making gruel, soup, and bread. Other foods used by the Patwin include deer, fish (including salmon, perch, pike, and sucker), birds (such as geese, duck, and quail), blackberries, elderberries, grubs, worms, seeds, bulbs, and wild honey (Johnson, 1978).

Patwin architecture is very complex in terms of its permanence, size, and the amount of people required to organize and build community structures. Patwin dance houses are said to have been some of the largest in California (Kroeber, 1932; McKern, 1923). Patwin houses were constructed for both permanent and temporary functions, and have been designated into four types of permanent housing: the dwelling house, the menstrual hut, the sweat house, and the ceremonial dance house. Patwin dance houses were the largest community structures, and were larger than those of the Nomlaki and Wintu (Kroeber, 1925). Somewhat unique to the Patwin, although also practiced by the Pomo and Nomlaki, was the use of granaries, which were used to store acorns and other grains.

The Patwin traded shell beads for obsidian, along with cordage, headbands, and other commodities from neighbors such as the Pomo along the coast and the Maidu in the foothills of the Sierra Nevada (Kroeber, 1965). Patwin ceremonial and religious practices combined elements of social performance, lineage, social hierarchy, economy, and technology. The Kuksu Society, or “big-head” dance, practiced in varying forms throughout California, was a male secret society focusing on initiation through ritualistic raising of the dead (Kroeber, 1925, 1932).

Nomlaki

The Nomlaki occupied an area that is nearly entirely within the present-day boundaries of Glenn and Tehama counties. Within Glenn County, the Nomlaki lived in the western half of the county, occupying some portion of the western valley edge and the east-facing slopes of the North Coast Range. In Tehama County, they controlled both sides of the Sacramento River and lands westward to the county line (Goldschmidt, 1978).

The Nomlaki are linguistically closely related to the Patwin, and they also shared many cultural traits. For example, because they inhabited similar environments, Nomlaki subsistence practices and staple foods were virtually the same as those of their Patwin neighbors. Other common traits were the construction of semi-subterranean, earth-covered dance houses; the strong leadership of a community chief, which was an inherited position; and the existence of occupational specialization, in which specific families were considered specialists in a variety of positions, such as fishing, medicine, or basketry (Goldschmidt, 1978).

Trading was an occupational specialty, but non-specialist individual families might also conduct trade for necessities. Trade between Hill and River Nomlaki populations were common, whereby the River communities would supply fish, and the Hill families would provide seeds and animals. The Nomlaki also participated in the trading system that extended up the Sacramento Valley to the Oregon border; shells from the San Francisco Bay were traded for skins, yew wood, and obsidian that would be passed down from the north (Goldschmidt, 1978).

Konkow Maidu

The Konkow Maidu lived along the Sacramento River within the Primary Study Area, although most of their territory was in the west-facing slopes of the Sierra Nevada. Their territory included the watersheds of Big Chico and Honcut creeks, and the South Fork Feather River, significant portions of the North and Middle forks of the Feather River, and the Feather River proper downstream of Oroville to downstream of Honcut Creek. The Konkow Maidu language is distantly related to Patwin and Nomlaki because it, too, is of the Penutian language stock (Riddell, 1978).

Konkow winter villages consisted of multi-family semi-subterranean homes that were centered along the Sacramento River or adjacent to the lower reaches of the major drainages within their territory. During the other seasons, they moved throughout their lands to hunt and gather foods to sustain them through the winter months. The Konkow moved up into the higher mountain elevations to hunt deer in the summer, while the gathering of acorns, pine, and other nuts was an important activity in the fall. Berries, seeds, roots, bulbs, and greens were harvested when they were ripe. Other important animal resources included elk, rabbits, and salmon (Riddell, 1978).

Descendants of the ethnographic Patwin, Nomlaki, and Konkow Maidu continue to live in or near the Primary Study Area today. Many members of the Native American community continue to have strong ties to their ancestral lands

18.2.3.3 Historic-Era Context

Contact between Native Californians and immigrant populations from all over the world occurred at various times in northern California, dating to as early as 1579, when Sir Francis Drake visited the Coast Miwok in Tomales Bay. The Primary Study Area formed the northern frontier of Spanish and Mexican territory. Accordingly, the region's earliest known non-Native Californian visitors consisted of Spanish military expeditions on patrol. The history of early culture contact in the Sacramento Valley began with the Moraga expedition of 1808 and ended suddenly with a devastating smallpox epidemic in 1833.

Colusa County

Colusa County was established in 1851, with its modern boundaries defined in 1891. Although trappers were most likely the first Europeans to visit the area, the first written account of Colusa County comes from John Bidwell, who in 1843 passed through the area enroute from Oregon to Sacramento (then known as Captain Sutter's Fort *New Helvetia)*. The earliest noted use of the proposed Sites Reservoir area was by Granville P. Swift. Swift constructed a stone corral to hold wild horses that he traded, and was reputed to have built an adobe house near the corral between 1844 and 1846 (Hobart, 2001).

Cattle grazing activities brought permanent residents to the region. The first recorded pioneers arrived in 1853 and settled at the stone corral and nearby Antelope Valley (Shoopman, 1951). Farming began in the early 1850s and generally took place without irrigation, although abundant springs in the area provided additional water when needed. Crops grown in the Antelope Valley and vicinity included wheat, cling peaches, grapes, and nectarines that were shipped to market by steamships stopping in Colusa along the Sacramento River on their way to Sacramento (Colusa Sun, 1890).

Two key mining activities, including the excavation of sandstone and salt, took place in and around the Antelope Valley in the late 1800s and early 1900s. Alfred Knowles began the first sandstone quarry near the town of Sites in 1886, adding impetus to the construction of the Colusa & Lake Railroad, which delivered the rock to Colusa, and then to various locales such as San Francisco. To house the quarry workers who arrived from such diverse locations as Prussia, Ireland, Germany, Australia, Switzerland, the British Isles, Sweden, Portugal, and Italy, the settlement of Quarryville was established on a flat between two sandstone mines. The town contained 10 to 12 new houses, a hotel and a saloon, and large machinery sheds by 1897 (Colusa Daily Sun, 1897 in Wallace, 1970). When cement began to replace sandstone as the construction material of choice, the quarry business slumped, forcing the railroad to cease its service in 1915. The loss of railroad service caused further hardship on the quarries by limiting their ability to transport their stone to outside sources (Wagon Wheels, 1987). By the early 1920s, the Sites area had lost its two most valuable economic resources: sandstone mining and the railroad. Quarryville completely vanished by approximately 1917 (Colusa Daily Sun, 1916 in Wallace, 1970).

Although salt mining in Antelope Valley took place as early as 1860, more intensive mining activities began with the formation of the Antelope Crystal Salt Company in 1890. Salt mining in the proposed Sites Reservoir area, however, could not compete with larger firms from the Bay Area and southern California. The Antelope Crystal Salt Company was officially dissolved in 1900, thus ending the large-scale manufacturing of salt in Colusa County. In the spring of 1865, oil was discovered in Colusa County. Several test wells were drilled in the Antelope Valley area, but none proved profitable (Geis, 1923; Green, 1950).

The town of Sites was established in 1886 on land donated by John Sites, who arrived in the area in 1853 and owned over 5,000 acres where he farmed and raised cattle. The town was originally constructed to serve as the terminus for the Colusa & Lake Railroad, which was established primarily to provide transportation of local crops to market. By 1887, with the opening of the sandstone quarries and the influx of laborers, the town possessed a store, a post office and a school, soon followed by hotels, boarding houses, and a church (Green, 1950; Wagon Wheels, 1987). After the Colusa & Lake Railroad ceased its service and the quarries closed down, Sites was still a viable town serving farmers and ranchers in the area.

A series of economic and natural disasters dramatically affected the town. The closing of the quarries around 1910, coupled with the abandonment of the railroad, was detrimental to the economic health of the town during the early decades of the 20th Century. In 1965, a large wildfire measuring three to four miles wide swept through the town, destroying many of the houses, and sealing the fate of the once thriving community (Wagon Wheels, 1987). By 1987, the population of Sites had diminished to a total of 17. The school building, train depot, railroad warehouse, and churches have since vanished, and today only a handful of homes and abandoned structures dot the landscape that was once a bustling town. The remains of a water tank, a few partially buried railroad ties, and abandoned town streets are some of the few remaining relics of Sites.

Glenn County

Glenn County was created from the northern portion of Colusa County when that county was divided. It was incorporated on March 15, 1891. The county was named for Doctor Hugh J. Glenn, a dentist from Missouri, who came to California in 1849 and worked a mining claim at Murderer's Bar on the American River (Beck and Haase, 1974; Kyle et al., 2002). Dr. Glenn made several trips across the plains driving herds of cattle, horses, and mules from Missouri to California. In 1867, he purchased Rancho Jacinto in what is now Glenn County and began farming wheat (Gudde, 1998; Kyle et al., 2002). Dr. Glenn continued to purchase land until he had thousands of acres under wheat cultivation and 200 to 300 employees. The community of Jacinto, 27 miles north of the town of Colusa, served as the supply center for his operation because of its proximity to the Sacramento River. The town provided housing for his employees, a hotel, a large general store, several blacksmith shops, a butcher shop, a post office (1858-1910), several large grain warehouses, and the first school established in the region (Kyle et al., 2002). In 1879, the New Constitution and Democratic parties nominated Dr. Glenn for governor of California, but he was defeated by George C. Perkins. On February 17, 1883, Dr. Glenn was shot to death at his home by an employee. He did not live to see the county named after him. The land amassed by the man who would become known as the world's "Wheat King" has since been subdivided into smaller farms and is now all irrigated (Kyle et al., 2002). The town of Jacinto, where he established his empire, is gone.

The community of Willows was formed in 1876 when the Central Pacific Railroad pushed its lines northward to Oregon. The town was named from a clump of willow trees bordering a water hole fed by several springs that stood out on the otherwise treeless plain. In the early days, it was the only landmark between the settlements on the river to the west and the foothills to the east (Gudde, 1998; Kyle et al., 2002). By the time Willows was established, the water hole had been filled in. From 1880 until 1916, the post office was known as Willow until the *s* was added in 1917. Willows became a center for shipping in the late 19th century for many large wheat and barley ranches. When Glenn County was formed in 1891, Willows was named the County seat and continues as the County seat today (Kyle et al., 2002). The City of Willows also serves as the headquarters for the Mendocino National Forest, which covers the western section of the County (Beck and Haase, 1974).

Glenn County has retained its agricultural origins with over one thousand farms dominating the economy. Major commodities include rice, wheat, hay, almonds, walnuts, corn, oranges, prunes, milk products, and livestock (Glenn County Court, 2011).

18.2.3.4 Cultural Resources

Methodology

A records search for the Primary Study Area was conducted at the Northwest Information Center, California State University, Sonoma (NWIC) and the Northeast Information Center, California State University, Chico (NEIC), of the California Historical Resources Information System (CHRIS). Archival research of historical records at various repositories was conducted, and consultation with Native American Tribes and other knowledgeable individuals was initiated.

California State University, Chico's Archaeological Research Program (ARP) conducted an intensive pedestrian survey of the proposed Sites Reservoir, including the inundation area (except for lands that were inaccessible due to lack of landowner permission), the Sites and Golden Gate dam sites, the nine saddle dam locations, the Sites Reservoir Inlet/Outlet Structure, the Recreation Area locations, and the road relocations and South Bridge site. The inventory covered 35,774 acres, and 144 archaeological sites were recorded on California Department of Parks and Recreation forms (DPR 523); another 429 archaeological isolates were also recorded. A draft inventory report outlining the results of this study was prepared by White et al. (2009), which was updated in 2013 (Offermann, 2013).[9] Furthermore, the ARP conducted a partial archaeological inventory of the proposed Delevan Pipeline, Delevan Pipeline Intake Facilities, and Delevan Pipeline Discharge Facility (Westwood and White, 2005). Because the survey areas included a buffer around these facilities, virtually the entire area within the proposed Project Buffer has been surveyed; the exception being the area around and west of the Holthouse Reservoir Complex. Survey of the proposed Holthouse Reservoir Complex, however, has been initiated and approximately 348 acres of this facility have been studied by California Department of Water Resources (DWR) archaeologists. The remaining proposed Project facilities were not surveyed for archaeological resources due to lack of access or because the facilities were added too late to the Project description to allow for field work. Areas and facilities that remain to be surveyed for archaeological resources prior to Project construction include:

- 790 acres within the Sites Reservoir footprint
- Previously inaccessible portions of the Delevan Pipeline
- The remaining portions of the Holthouse Reservoir Complex (including the location of the Holthouse Reservoir Electrical Switchyard) and Project Buffer
- Sites Pumping/Generating Plant
- Tunnel from Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure
- Sites Electrical Switchyard
- Field Office Maintenance Yard
- GCID Canal Facilities Modifications
- TRR
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline Electrical Switchyard
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- GCID Canal Connection to the TRR
- Delevan Transmission Line (only the portion that is not located within the Delevan Pipeline construction disturbance area).

An inventory of the built environment resources outside of the proposed Sites Reservoir Inundation Area was conducted in the fall of 2012 by URS Corporation (URS) (Jimenez, 2013). This inventory identified and recorded 15 resources on DPR 523 forms within the Primary Study Area. An evaluation of the resources determined that six appear eligible for listing in the National Register of Historic Places

[9] Archaeological data are considered confidential pursuant to California PRC 6254.10 and Section 304 of the National Historic Preservation Act; therefore, these reports are not appended to this document.

(NRHP) and the California Register of Historical Resources (CRHR), and nine do not appear eligible for the NRHP/CRHR. Two resources, Funks Dam and the Tehama-Colusa Canal, were found to be less than 45 years old and were not recorded. A listing of the recorded and evaluated resources is presented in Table 18-1. Descriptions of the resources are presented under "Historic-Era Resources" below.[10]

Table 18-1
Built Environment Resources Identified Outside of the Proposed Sites Reservoir Inundation Area in the Primary Study Area

Property Type	Site Name/Location	County	Owner	Description	Evaluation
Farmstead	Huffmaster Road Farmstead (1), Antelope Valley	Colusa	Private Ownership	Two circa 1964 and 1962 ranch-style houses, pre-1952 barns, non-historic period outbuildings	Evaluated-Ineligible
Farmstead	Huffmaster Road Farmstead (2), Antelope Valley	Colusa	Private Ownership	Circa 2006 single-family house, circa 1920 barn and 1970 shop	Evaluated-Ineligible
Farmstead	McDermott Road Farmstead (1), Maxwell	Colusa	Private Ownership	Two single-family houses, six silos, and two outbuildings.	Evaluated-Ineligible
Farmstead	McDermott Road Farmstead (2), Maxwell	Colusa	Private Ownership	A 1920 single-family house, circa 2000 barn, circa 1952 outbuilding, and single trailer	Evaluated-Ineligible
Farmstead	Funks Reservoir Farmstead	Colusa	Private Ownership	Circa 1933 single-family farmhouse, pole barn, lambing barn, workshop, livestock scale, water tank, pumphouse, and chicken coop	Evaluated-Ineligible
Farmstead	County Road 69 Farmstead, Antelope Valley	Glenn	Private Ownership	A 1938 single-family house, bunkhouse, and shed, all built in 1938; three 1967 pole barns and lambing barn, all built in 1967. Numerous non-historic buildings are also on the property	Evaluated-Ineligible
Quarry	Knowles Quarry, Maxwell	Colusa	Private Ownership	Circa 1886 Sites Sandstone quarry, also known as the Knowles Quarry. Two non-historic buildings, a mobile trailer, and pole barn, are on-site	Evaluated-Eligible
Canal	Glenn-Colusa Canal Headgate	Glenn	GCID	Circa 1941 eight-bay concrete constructed headgate/bridge; earthen bermed canal prism with stone riprap sides	Evaluated-Ineligible
Canal	Glenn-Colusa Canal	Colusa and Glenn	GCID	Circa 1887-1920 earthen canal	Evaluated-Eligible
Levee	Sacramento River Levee, near Stegeman	Colusa	USACE/Maxwell Irrigation District	Circa 1947-53 earthen berm levee/road	Evaluated-Eligible
Canal	Maxwell Irrigation District Canal, near Stegeman	Colusa	Maxwell Irrigation District	Maxwell Irrigation District, old pumping plant and drainage canal	Evaluated Ineligible/
Canal	Colusa Basin Drain	Colusa	Colusa Basin Drainage District	A 10-mile earthen bermed canal, built between 1903-1911; contributing features added in 1919-1920	Evaluated-Eligible
Railroad	Union Pacific Railroad Siphon, Willows	Glenn	GCID	Circa 1917 gravitational railroad siphon located on the GCID Canal and Union Pacific Railroad	Evaluated-Eligible

[10] Full descriptions and evaluations of the 15 evaluated built environment resources are presented in Jimenez (2013), including DPR 523 forms for each resource.

Table 18-1
Built Environment Resources Identified Outside of the Proposed Sites Reservoir Inundation Area in the Primary Study Area

Property Type	Site Name/Location	County	Owner	Description	Evaluation
Road	Colusa & Lake Railroad Historic District along Stone Corral Creek	Colusa	Colusa County	Two circa 1886 roads that include the historic C&LRR bed and a wagon road	Evaluated-Eligible
Utility Line	WAPA Transmission Line towers, near Funks Reservoir	Colusa	Private Ownership	Two circa 1958-60 transmission lines and towers that carry power for WAPA	Evaluated-Ineligible

Several other detailed cultural resources studies would be required to comply fully with federal and State cultural resources laws prior to construction of the Project (any alternative). These include the recordation of historic-era built environment resources within the reservoir footprint, and a detailed ethnographic study of the Primary Study Area to identify TCPs. Furthermore, in an effort to identify geographic areas sensitive for buried cultural resources, geoarchaeological studies would be conducted. Lastly, all cultural resources identified within the Primary Study Area would be evaluated for eligibility for inclusion in the NRHP and the CRHR. These activities would be carried out under the guidance of a programmatic agreement (PA), pursuant to the implementing guidelines of Section 106 of the National Historic Preservation Act (see Chapter 4 of this EIR/EIS) found at 36 CFR 800.4(b)(2), which allows for phased identification and evaluation of cultural resources in situations where the identification of historic properties cannot readily take place for a variety of reasons such as the consideration of alternatives that consist “of corridors or large land areas, or where access to properties is restricted…” A PA may also be used according to 36 CFR 800.14(b)(1)(ii), “[w]hen effects on historic properties cannot be fully determined prior to approval of an undertaking.” Given the large land base associated with the NODOS Project, the lack of access to all parcels within the Primary Study Area, and the large number of cultural resources that would ultimately require evaluation for NRHP/CRHR-eligibility, execution of a PA is the most efficient and effective manner to ensure that the lead federal agency would fulfill the requirements of the NHPA, including the identification of historic properties and the resolution of adverse effects to historic properties. Criterion 36 CFR 800.14(b)(1)(i), which refers to effects that are “similar or repetitive…in scope,” and which is appropriate to address reservoir fluctuations at the proposed Sites Reservoir, would also be included in the PA.

Potential impacts to historic properties in the Extended Study Area would similarly be discussed in the PA because individual projects or programs associated with the study area have not yet been determined, and may not be defined for many years in the future. The use of a PA to address future impacts to historic properties in the Extended Study Area is appropriate under several qualifying criteria found under 36 CFR 800.14(b)(1), including: 36 CFR 800.14(b)(1)(i), which refers to effects that “similar or repetitive or are multi-state or regional in scope” such as reservoir fluctuations, as previously mentioned; 36 CFR 800.14(b)(1)(ii), as noted above; 36 CFR 800.14(b)(1)(iii) for “[w]hen nonfederal parties are delegated major decision making responsibilities,” such as at the State or other local governments or water agencies; and 36 CFR 800.14(b)(1)(iv), when “routine management activities are undertaken at Federal installations, facilities, or other land management units” such as San Luis Reservoir.

The PA would involve the U.S. Bureau of Reclamation (Reclamation) as the lead federal agency, the Advisory Council on Historic Preservation, the California State Office of Historic Preservation, DWR, interested Native American tribes, and members of the public. Because DWR would be a participant in the PA, this agreement document would also ensure that the State would fulfill its obligations toward cultural resources pursuant to CEQA.

Prehistoric Resources

Human occupation in the Primary Study Area may extend back as far as 10,000 B.P. or more. Known prehistoric resources in the Primary Study Area include habitation or village sites, temporary campsites, bedrock milling features, lithic scatters, and isolated artifacts, such as projectile points, ground stone implements, cores or core tools, and flakes (White et al., 2009). Previous studies provide strong evidence that prehistoric resources are potentially present at all proposed Project feature locations.

Sites Reservoir Inundation Area, Golden Gate Dam, Sites Dam, Nine Saddle Dams, Recreation Areas, Road Relocations and South Bridge, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, and Field Office Maintenance Yard

The cultural resources inventory of the proposed Sites Reservoir Inundation Area and damsites identified 50 prehistoric sites, 14 of which are multi-component sites that include both prehistoric and historic elements. Site types include, but are not limited to, housepits, middens, bedrock mortar sites, and flaked stone and ground stone scatters. In addition, 100 prehistoric isolated artifacts were recorded, two of which are multi-component. These include flake stone tools, debitage (flaking residue from stone tool manufacture), handstones, millingstones, pestles, portable and bedrock mortars, battered cobbles, and anvil stones. Prehistoric archaeological resources may exist in portions of the Sites Reservoir Inundation Area and at some of the appurtenant facility locations that remain to be surveyed. These may include resources that are visible, as well as those that are completely buried and, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. As a result, areas that have not yet been studied would be surveyed according to the guidelines of the PA prior to Project construction. Furthermore, all prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The footprint of the existing Funks Reservoir was inventoried and documented by Chartkoff (1969) and West, Levulett, and True (1976) prior to construction and inundation. Three prehistoric resources were identified and recorded during those efforts: CA-COL-233 (previously designated as Funks Creek 1 and Chartkoff-COL-28), CA-COL-242 (previously designated as Funks Creek 2 and Chartkoff-COL-37), and CA-COL-53 (previously designated as Funks Creek 3). Intensive artifact collection and limited trenching were conducted at all three sites, and limited excavation was conducted at CA-COL-242 and CA-COL-53. The studies revealed that the sites were recent prehistoric non-midden surface artifact scatters. Due to the nature of the sites and the low yield of subsurface artifacts obtained through excavation and trenching, it was further determined that the probability of discovering additional subsurface artifacts was very low. The report, therefore, concluded that the sites retained no opportunity to provide additional knowledge to the understanding of history or prehistory. As a result, they were determined not eligible for inclusion in the National Register.

A record search was conducted of the proposed Holthouse Reservoir Complex (i.e., Dam and Reservoir area) by the NWIC. The record search did not identify any previously recorded resources within the dam and reservoir footprint. The search also indicated that the Holthouse Dam and Reservoir, and consequently the Holthouse Reservoir Electrical Switchyard, are entirely within the limits of a survey conducted for the T-C Canal in 1965 (Treganza et al., 1965).

Approximately 348 acres of the Holthouse Reservoir Complex have been surveyed for the proposed Project. One prehistoric isolate, a chert flake, was recorded on the north shore of Funks Reservoir, but no archaeological sites have been found to date. However, archaeological resources may exist in portions of the reservoir that remain to be surveyed, including those that may be completely buried and are, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. Those portions of the Holthouse Reservoir Complex that have not yet been studied would be surveyed according to the guidelines of the PA prior to Project construction. Furthermore, prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Glenn-Colusa Irrigation District Canal Facilities Modifications

A cultural resources record search of the GCID Canal and associated headworks facilities was conducted by White and Crawford (2003a) at the NWIC and the NEIC of the CHRIS. The records searches identified one previously recorded prehistoric resource, CA-GLE-106, in proximity to the GCID Canal alignment. CA-GLE-106 is a habitation site containing fractured stone and shell fragments. A pedestrian survey of the canal alignment at the locations where facility modifications would occur has not yet been undertaken; therefore archaeological resources may exist, including those may be completely buried and are, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. Archaeological survey would be conducted prior to Project construction according to the guidelines of the PA. Furthermore, prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

White and Crawford (2003a) conducted a cultural resources records search at the NWIC and NEIC of the CHRIS that included the proposed TRR, the TRR Pumping/Generating Plant, and the GCID Canal Connection to the TRR. The records search consequently also included the locations of the proposed TRR Electrical Switchyard. No prehistoric resources within or near these project features were identified during the records search. As a result, archaeological resources may exist at the locations of these facilities, including those that may be completely buried and are, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. A pedestrian survey of all new facility footprints will occur prior to Project construction according to the guidelines of the PA. Furthermore, prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line

A partial survey of the proposed Delevan Pipeline route east of Interstate 5 was conducted by California State University, Chico's ARP (Westwood and White, 2005). No prehistoric resources were identified as a result of the survey. However, archaeological resources may exist in areas that were not surveyed, including those that may be completely buried and are, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. Additional survey would be required to inspect the entire pipeline alignment, and for the TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line prior to Project construction according to the guidelines of the PA. Furthermore, prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility

An inventory of the proposed Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility was conducted by California State University, Chico's ARP (Westwood and White, 2005). No prehistoric resources were documented as a result of this inventory. However, a previous cultural resource survey conducted by White (2003) along the Sacramento River resulted in the identification of prehistoric resources approximately 0.25 mile from the proposed intake. Resources observed by White (2003) included chipped stone tools, mortars, pestles, handstones, millingstones, earthenware, and middens. Although no archaeological resources have been identified at the locations of the Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility, it is possible that such resources may be completely buried and are, therefore, invisible on the ground surface. Unmarked burials or cemeteries may be similarly present. Should prehistoric remains be identified during Project construction, they would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Project Buffer

The archaeological inventory conducted within the Sites Reservoir Survey Area includes virtually all of the area within the proposed Project Buffer. Thirty-three prehistoric archaeological sites, of which nine are multi-component, and 21prehistoric archaeological isolates, were recorded within the Buffer beyond the footprint of the proposed Sites Reservoir and the appurtenant facilities. The area around the proposed Holthouse Reservoir Complex and acreage west to Sites Reservoir within the Project Buffer has not yet been inventoried for prehistoric resources. An inventory of this Project component would be conducted prior to Project construction according to the guidelines of the PA. Furthermore, prehistoric archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate. The inventories conducted for the Delevan Pipeline Intake/Discharge facilities include all of the area within the Project Buffer around those facilities.

Ethnographic Resources

Information regarding the ethnographic places in the Primary Study Area is provided from existing literature. A detailed inventory of the ethnographic resources in the Primary Study Area will be conducted prior to Project construction according to the guidelines of the PA. Furthermore, ethnographic resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate. These studies would be conducted for all elements of the Primary Study Area, as listed below.

The Primary Study Area is contained within the ethnographic territory of two Hill Patwin communities: the *Choo-hel'-mem-sel* and the *Ko'-roo* (Kroeber, 1932; White et al., 2009). The majority of ethnographic resources cluster around the northwest corner of the proposed Sites Reservoir. Ethnographic resources become scarcer in the eastern portions of the Primary Study Area that are in the Sacramento Valley. This is primarily because these lands were historically uninhabitable marshlands. Several ethnographic sites exist, however, near the Sacramento River, in and around the vicinity of the proposed Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility.

Sites Reservoir Inundation Area, Golden Gate Dam, Sites Dam, Nine Saddle Dams, Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, Recreation Areas, and Road Relocations and South Bridge

According to White et al. (2009), a majority of the proposed Sites Reservoir footprint, including the proposed inundation area, the Sites and Golden Gate damsites along with the nine saddle dam locations, the Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Field Office Maintenance Yard, the Recreation Areas, and associated Road Relocations and South Bridge site would be located within the ethnographic territory of the *Choo-hel'-mem-sel.* At least seven ethnographic place names are located in the vicinity of the Sites Reservoir footprint. A majority of the ethnographic sites identified are village or rancheria locations that tend to cluster around the proposed reservoir's northwest edge. One of these place names, *Choo'-dah-kut*, has been identified within Antelope Valley near the town of Sites (White et al., 2009).

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The existing Funks Reservoir and the proposed Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard are/would be located within the ethnographic territory of the *Choo-hel'-mem-sel* (Kroeber, 1932; White et al., 2009). No known ethnographic resources are located in the immediate vicinity of Funks Reservoir or the proposed Holthouse Reservoir.

GCID Canal Facilities Modifications

The existing GCID Canal and associated proposed headworks facilities are located within the ethnographic territory of the *Ko'-roo* (Kroeber, 1932; White et al., 2009). No known ethnographic resources are located in the immediate vicinity of the GCID Canal or associated headworks.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and the Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

The proposed TRR would be located within the ethnographic territory of the *Ko'-roo* (Kroeber, 1932; White et al., 2009). No known ethnographic resources are located in the immediate vicinity of the proposed TRR, the TRR Pumping/Generating Plant, TRR Electrical Switchyard, or the GCID Canal Connection to the TRR.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line

The proposed Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line would cross the ethnographic territories of both the *Choo-hel'-mem-sel* and the *Ko'-roo* (Kroeber, 1932; White et al., 2009). There are no known ethnographic resources within the immediate vicinity of the Delevan or TRR pipelines, the TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, or the Delevan Transmission Line.

Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility

The proposed Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility would be located within the ethnographic territory of the *Ko'-roo* (Kroeber, 1932; White et al., 2009). The intake structure and discharge facility are located adjacent to the ethnographic village of the *Ts'a*. There are several other ethnographic villages in proximity to those proposed structures, including the *K'etil* to the north and the *YYaitere* to the south.

Project Buffer

The proposed Project Buffer would surround all Project facilities, with the exception of the Delevan Pipeline, Delevan Transmission Line, TRR Pipeline and Road, Delevan Pipeline Electrical Switchyard, TRR to Funks Creek Pipeline, and portions of the other roads. The Project Buffer would, therefore, be located within the ethnographic territories described above for the facilities that it surrounds.

Historic-Era Resources

Historic-era resources occur throughout the Primary Study Area. Historic-era resources within the Primary Study Area may include both archaeological deposits and resources of the built environment. These resources are comprised of town sites, structures, transportation facilities, water conveyance systems, resource extraction facilities (such as quarries), ranches and associated facilities, homesteads, privy pits, and dumps.

Sites Reservoir Inundation Area, Golden Gate Dam, Sites Dam, Nine Saddle Dams, Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Recreation Areas, and Road Relocations and South Bridge

The cultural resources inventory identified 34 historic-era archaeological resources within the proposed Sites Reservoir footprint, the damsites, the recreation areas, and the location of the South Bridge; 14 of the sites are multi-component sites that include both prehistoric and historic elements (White et al., 2009). Site types are overwhelmingly related to farming and homesteading and include, but are not limited to, habitation features such as hearths, chimneys, flats, rock alignments, historical debris scatters, and farming equipment. In addition, 118 historic-era isolated artifacts or features were recorded, two of which are multi-component. Most historic-era isolated artifacts, such as fencing or plow blades, relate to ranching or farming activities. Historic-era archaeological resources may exist in portions of the Sites Reservoir inundation area and at some of the appurtenant facility locations that remain to be surveyed. These resources may be visible, or may be completely buried and, therefore, invisible on the ground surface. As a result, areas that have not yet been studied would be surveyed according to the guidelines of the PA prior to Project construction. Furthermore, all historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

The built environment study (Jimenez, 2013) identified two resources within these portions of the Primary Study Area, as described below:

- The Colusa & Lake Railroad Historic District is located along Stone Corral Creek and is, therefore, located within the footprint of the proposed Sites Dam. The entire length of the District is 1.5 miles, from west of the town of Sites to the east to 0.25 mile beyond the edge of the proposed Project Buffer, although the entire length of the railroad and road is eight miles. This historic district consists of visible remnants of the original wagon road that extended between Maxwell and Sites, and the footprint of the Colusa & Lake Railroad, which has since become Maxwell Sites Road. Both the railroad and the wagon road were constructed in 1886 to support the transfer of people and goods, particularly sandstone from the local quarries, from Sites to Maxwell and Colusa. The two transportation features are intimately linked as they criss-cross numerous times along Stone Corral Creek. The period of significance for the District is 1986 to 1915, from the time of construction until the tracks were removed from the railroad. The District appears eligible for the NRHP under Criterion A for its association with the Colusa & Lake Railroad and the development of the town of Sites. The District is eligible for the CRHR under Criterion 1.
- The Funks Reservoir Farmstead is located in the area of the proposed Sites Reservoir Inlet/Outlet Structure. This farm complex is contained on a 230-acre parcel and is comprised of a number of buildings that date to about 1933. The various structures include a single-family residence, an open-eaved barn, an enclosed pole barn, a shed-roof workshop, a chicken coop, a water tank, and a pumphouse. Although the land once belonged to an early Antelope Valley rancher, the buildings are not associated with him and are not architecturally significant. As a result, the Funks Reservoir Farmstead does not appear eligible for the NRHP or the CRHR.

In addition to the resources described above, other built environment historic-era resources within the reservoir footprint include 19 residential dwellings, 15 ranch compounds, and 27 miscellaneous outbuildings. None of these structures have been formally recorded or evaluated for eligibility to the NRHP or the CRHR for the Project. Recordation and NRHP/CRHR eligibility evaluation of these resources would be required prior to Project construction according to the guidelines of the PA. Furthermore, mitigation measures would be applied, as appropriate.

The proposed Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to the Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard have not yet been inventoried for historic-era archaeological resources. An inventory of these proposed Project components would be conducted prior to Project construction according to the guidelines of the PA. Furthermore, historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The footprint of the existing Funks Reservoir was inventoried and documented by Chartkoff (1969) and West et al. (1976) prior to its construction and inundation. One historic-era site, CA-COL-233 (previously designated as Funks Creek 1 and Chartkoff-COL-28), was recorded as a result of those studies. However, when Chartkoff (1969) recorded the site, only the prehistoric component was noted. It was not until

West et al. (1976) recorded the site that the historic-era component was added, although the trinomial still lacks the multicomponent designation. CA-COL-233 consists of a cabin and several associated historic-era items including a sewing machine, stove fragments, several tableware items, remnants of outbuildings, and other miscellaneous items. West et al. (1976) provided a date range of 1890 to 1916 for this site. CA-COL-233 was determined not eligible for inclusion in the National Register.

Approximately 348 acres of the proposed Holthouse Reservoir Complex have been surveyed for historic-era archaeological resources. No historic-era archaeological resources have been found to date, and a record search for the T-C Canal (White and Crawford 2003b) did not identify any previously recorded cultural resources in the vicinity of the existing Funks and proposed Holthouse reservoirs. However, resources may exist in portions of the reservoir complex that remain to be surveyed, including those that may be completely buried and invisible on the ground surface. The only known built environment resources within the Holthouse Reservoir Complex are the T-C Canal, Funks Dam, and the Western Area Power Administration (WAPA) Maxwell-Olinda 500-kV transmission lines. The T-C Canal and Funks Dam, which would be decommissioned within the reservoir footprint, were completed in 1980 and are, therefore, not of sufficient age to be considered for listing on the NRHP/CRHR. However, that portion of the T-C Canal in the Primary Study Area and Funks Dam would be recorded as cultural resources prior to Project construction.

The WAPA Transmission Line consists of two circuits with paralleling lattice steel towers that are aligned on a north-south axis 0.25 mile east of existing Funks Dam and through the proposed Holthouse Reservoir footprint. The towers are part of the 80-mile-long Maxwell-Olinda 500-kV transmission line that connects the Olinda Substation in Tehama County to the Maxwell Substation in Colusa County. The entire WAPA line contains 363 transmission towers. The segment within the Project area is approximately 0.5 mile in length where it crosses the footprint of the Holthouse Reservoir; towers within this section would be moved. The towers and transmission lines were built between 1958 and 1960 as part of a larger circuit. The substations at Olinda and Maxwell were both constructed in 1986 and this transmission line was re-circuited at that time. The WAPA Maxwell-Olinda 500-kV transmission lines have integrity, and even though the resource is part of a larger network of transmission lines and towers built between 1958 and 1960 throughout the western United States, the Olinda and Maxwell substations were not constructed until 1986. Therefore, the existing circuit is not yet over 45 years old, and is not eligible for the NRHP or the CRHR.

A cultural resources inventory of the Holthouse Reservoir Complex, including the location of the Holthouse Reservoir Electrical Switchyard, would be completed prior to Project construction according to the guidelines of the PA. Furthermore, historic-era resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Glenn-Colusa Irrigation District Canal Facilities Modifications

White and Crawford (2003a) conducted an archaeological records search for the GCID Canal at the NWIC and the NEIC of the CHRIS. Eight historic-era resources were identified along or adjacent the entire length of the Canal, including three historic-era town sites, a highway alignment, a California Historic Landmark, two railroad alignments, and the GCID Canal and associated features, itself. Of these eight resources, only the GCID Canal has been formally recorded and is identified by the State trinomial CA-GLE-605H. Only one other historic-era resource has been identified in the Project area in proximity to the GCID Canal Intake and headworks facilities. An additional six historic-era resources (a town site, a cemetery, a school building, a grange building, a river transportation feature, and a point of historical interest) were identified within one mile of the Canal. An archaeological survey for historic-era resources would be conducted prior to Project construction according to the guidelines of the PA. Furthermore, historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

The GCID Canal Railroad Siphon, and headworks and prism, were recorded as part of the NODOS built environment study (Jimenez, 2013). It is a circa 1917 engineered structure designed by the Central Irrigation District to convey water via gravitational forces under the railroad bed of the Southern Pacific Railroad. The siphon is constructed of board-formed concrete and is approximately 51 feet wide by 84 feet long with approximately four-foot-high walls. The concrete is buttressed slightly to the railroad bed and has horizontal structural cracks due to water pressure over time. The water level on the east side of the canal is slightly higher than the west side, as it gravitationally siphons water through tilting pipes under the railroad bed. According to GCID District Engineer Ben Pennock, the railroad siphon has not been altered, and is original to circa 1917. The Union Pacific Railroad siphon is significant for its association with the Central Irrigation District and GCID as part of an early irrigation district (Criteria A and 1). The siphon possesses a distinctive type of design and method of construction as an irrigation structure and expresses high artistic values represented in distinguishable characteristics as a feature of the original Central Irrigation Canal as it passes under the Southern Pacific Railroad. The railroad siphon is a unique engineered structure, designed to convey water by gravitational force under an existing railroad bed through pipes, like a straw, and is, therefore, eligible under Criteria C and 3. Thus, the GCID Canal Railroad Siphon appears individually eligible for the NRHP and the CRHR, and is a contributing element to the GCID Canal as a whole (see below).

The GCID Canal headgate structure was constructed around 1941, replacing an earlier headgate that was built as part of the Central Irrigation District in the late 19th century. The existing headgate is located 60 feet south of the original Central Irrigation District headgate. It operates as a narrow two-lane bridge across the canal from County Road 203 to County Road 205. The bridge deck is approximately 19 feet wide by 209 feet long, and is constructed of board-formed concrete; a simple pole railing interconnects with concrete posts. The canal prism was also modified in 1941 to accommodate the new headgate and was extended north to its present confluence with the Sacramento River at that time. Because the headgate is not directly associated with the original Central Irrigation District canal and features, it does not appear to be individually eligible for the NRHP or the CRHR. Also, because it does not date to the period of significance for the GCID Canal (see below), in general, it is not a contributing element to that resource.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

White and Crawford (2003a) conducted an archaeological records search at the NWIC and the NEIC of the CHRIS that included the proposed TRR, the TRR Pumping/Generating Plant, TRR Electrical Switchyard, and the GCID Canal Connection to the TRR. Except for the presence of the GCID Canal, recorded as site CA-GLE-605H, no other historic-era resources within or near these proposed Project features were identified during the records search. The built environment study, however, identified and evaluated three historic-era resources located within the vicinity of these Primary Study Area features (Jimenez, 2013). The resources (the GCID Canal and two farmsteads) are described below:

- The GCID Canal began construction as the Central Irrigation Canal in 1887, and assumed its current name in 1920. The ability of the canal to deliver water to farms along its length of 65 miles contributed significantly to the agricultural development of Glenn and Colusa counties. The GCID Canal was previously evaluated, and it appears to be eligible for listing to the NRHP and CRHR under Criteria A and 1, respectively, due to its association with the Central Irrigation District and the development of irrigation and farming in the Sacramento Valley. It also appears eligible for listing to the NRHP and the CRHR due to its association as an early 20th century engineered system that includes the main canal and associated ditches, which provided water to hundreds of farmsteads in the Sacramento Valley between 1887 to 1920 (Criteria C and 3). The period of significance for the GCID is between 1887 and 1920.
- The McDermott Road Farmstead (1) is located at the northeast corner of McDermott and Equipment roads, directly across the street from the planned TRR. The land was platted in 1912 by the Sacramento Valley Irrigation Company, who purchased the Central Irrigation District, and the property is bordered by lateral canals to the GCID Canal. However, there is no significant connection to the Central Irrigation District and the buildings present on the parcel are relatively modern. As a result, the McDermott Road Farmstead (1) does not appear eligible for either the NRHP or the CRHR.
- The McDermott Road Farmstead (2) is located directly across the street and west of McDermott Road Farmstead (1). This parcel will be directly adjacent to the east levee of the TRR. Like its eastern neighbor, the parcel was platted in 1912 by the Sacramento Valley Irrigation Company and it is bordered by a lateral canal of the GCID Canal. Structures on the farmstead include a 1920 single-family residence with a rear add-on porch and new double-pane vinyl windows, a circa 1952 outbuilding, and a circa 2000 large open hay barn. The residence lacks integrity and is not an exceptional example of an architectural type, and there is no significant connection to the Central Irrigation District; therefore, the McDermott Road Farmstead (2) does not appear NRHP/CRHR-eligible.

An archaeological survey for historic-era resources would be conducted within the Project area for the proposed TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, and the GCID Canal Connection to the TRR prior to construction according to the guidelines of the PA. Furthermore, historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line

A partial archaeological survey of the proposed Delevan Pipeline route east of I-5 was conducted by California State University, Chico's ARP (Westwood and White, 2005). Three historic-era isolated features were identified as a result of the survey. These include a single palm tree stump, a pumping station in an abandoned canal, and an adjacent water control gate located in the abandoned canal. Limited access and poor surface visibility were issues for this proposed Project component, therefore, only a small portion of the Delevan Pipeline was examined. The proposed TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line have not been inventoried and additional surveys of these facility footprints would be completed prior to Project construction according to the guidelines of the PA. As a result, historic-era archaeological resources may exist in these Project areas that remain to be surveyed, including those resources that may be completely buried and invisible on the ground surface. Historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

The NODOS built environment study identified one historic resource within the footprint of the Delevan Pipeline (Jimenez, 2013). This resource, the Colusa Basin Drain (CBD) is a 10- to 20-foot-wide dirt canal. It was initially constructed in 1903 as the result of linear borrow trenches created while building levees in the area. The CBD was completed in 1911 and additions, such as culverts and headgates, were added in 1919 and 1920, probably in conjunction with the GCID and widespread irrigation development in the Sacramento Valley. The CBD, which is 33 miles long, flows through Glenn, Colusa, and Yolo counties; the Primary Study Area includes 1,500 feet of this length. Various portions of the CBD have been recorded in the past and it was evaluated for the NRHP/CRHR in 2007. The CBD appears eligible for listing to the NRHP and the CRHR due to its association with agricultural economy of the region (Criteria A and 1), and for its association for engineering involved in irrigating the Sacramento Valley (Criteria C and 3).

Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility

An archaeological inventory of the proposed locations for the proposed Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility were conducted by California State University, Chico's ARP (Westwood and White, 2005). No historic-era archaeological resources within the vicinity of the proposed facilities were documented as a result of this inventory. However, a cultural resource survey conducted by White (2003) along the Sacramento River resulted in the identification of historic-era resources nearby. Historic-era isolated artifacts or features recorded by White (2003) range from historic foundations to glass debris. It is possible that historic-era archaeological resources may be completely buried and invisible on the ground surface. Should buried historic-era remains be identified during Project construction, they would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

The Sacramento River levee and the Maxwell Irrigation District (MID) Canal, both located within the proposed footprint of the Delevan Pipeline Intake/Discharge Facilities, were recorded and evaluated as part of the built environment study (Jimenez, 2013). The levee is an earthen bermed structure that is approximately 15 feet high, approximately 15 feet wide across the top, and 75 feet wide at its base. The resource may date as early as 1936; however, it likely was constructed sometime between 1947 and 1953. The levee appears eligible for the NRHP/CRHR under Criterion A/1 due to its association with the Sacramento River Flood Protection Project, which stemmed from the Flood Control Act of 1917 and fostered agricultural development of the Sacramento Valley.

The MID Canal is located on the land side of the Sacramento River levee within the proposed footprints of the Delevan Pipeline Intake and Discharge facilities. It consists of a concrete-lined canal that parallels the toe of the levee and an abandoned pumphouse directly adjacent to the levee. As an involved irrigation system, the MID Canal was first formed in 1918. This portion of the canal was developed between 1947 and 1953, probably after the development of the Sacramento River levee. Although the MID Canal is over 45 years old, the portion of the canal and its associated features in the vicinity of the Delevan Pipeline Intake and Discharge facilities has limited history, and does not appear to be associated with an early part of the 1918 MID Canal. As a result, the MID Canal within the proposed footprint of the Delevan Pipeline Intake and Discharge Facilities does not appear eligible for the NRHP or the CRHR.

Project Buffer

The archaeological inventory within Sites Reservoir Survey Area includes virtually all of the area within the proposed Project Buffer. Seventeen historic-era archaeological sites (nine multi-component) were recorded within the Project Buffer beyond the footprint of the proposed Sites Reservoir and the appurtenant facilities, along with 20 historic-era archaeological isolates. The area around the proposed Holthouse Reservoir Complex, and acreage west to the Sites Reservoir within the Project Buffer, have not yet been inventoried for historic-era archaeological resources. An inventory of this Project component would be conducted prior to Project construction according to the guidelines of the PA. Furthermore, historic-era archaeological resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate. The inventories conducted for the proposed Delevan Pipeline Intake/Discharge Facilities include all of the area within the Project Buffer around those facilities.

The built environment inventory includes the Project Buffer around the proposed Sites Reservoir footprint. Four built environment resources that are not related to the other facility development have been identified, recorded, and evaluated for the NRHP/CRHP within the Buffer outside of the Sites Reservoir Inundation Area. These resources include three farmsteads and one quarry district, as presented below:

- Huffmaster Road Farmstead (1) contains two early 1960s ranch-style houses on a single parcel at the very south end of Antelope Valley within the Project Buffer. A number of outbuildings on the property appear to date to the mid-1900s, none of which are excellent examples of architecture. Huffmaster Road Farmstead (1) does not appear to meet any of the eligibility criteria for listing on the NRHP or the CRHR.
- Huffmaster Road Farmstead (2) is located in the southeast corner of Antelope Valley. Portions of the ranch that do not contain buildings would be inundated by the proposed Sites Reservoir. The property contains a residence from the early 2000s, a circa 1970 workshop, and a wooden barn from the 1920s. The parcel has been farmed since the 1860s, but there are no remaining extant structures that reflect the earliest days of the ranch, and the barn does not reflect an exceptional architectural style. As a result, Huffmaster Road Farmstead (2) does not appear eligible for listing on the NRHP or the CRHR.
- The County Road 69 Farmstead is situated at the north end of Antelope Valley in Glenn County. The property is a vernacular farmstead and an active cattle ranch that includes a single-family farmhouse, a bunkhouse, and two joining sheds that were all built around 1938. A nearby lambing barn and three separate pole barns were constructed in 1967. The farmstead has various features that are less than 45 years old, such as a 1973 double-wide mobilehome with carport, a metal shed/bathroom, and numerous auxiliary structures, such as silos, dog kennels, and corrals. Many of the 1938 buildings have been altered with the addition of aluminum sliding glass windows and T-111 plywood siding. Historically, the farmstead was a sheep farm that was converted to a cattle ranch after it was purchased by the current property owner sometime around 1982. Although many of the ranch buildings are over 45 years old, the County Road 69 Farmstead does not appear to meet any of the eligibility criteria for listing on the NRHP/CRHR.
- The Stone Corral Creek Quarries Historic District consists of two historic sandstone quarries located on the east-facing slope of Logan Ridge, and on both sides of Stone Corral Creek and Maxwell Sites Road. The Knowles Quarry, located north of Stone Corral Creek and Maxwell Sites Road, was the first quarry in the area. The quarry was developed by pioneer John Sites in 1887-1888 as the Sites

Sandstone Company. The McGilvray Quarry known, also as the Thompson Quarry, was first opened in 1897 and is located south of the Knowles Quarry, and south of Stone Corral Creek and Maxwell Sites Road; McGilvray purchased the property in 1900. Both quarries were major suppliers of stone for the rebuilding of San Francisco after the 1906 earthquake. They both also closed in 1914, and all equipment was liquidated in 1915. The McGilvray Quarry reopened for a time in 1925, and again in 1957. The Knowles Quarry has recently re-opened. Both quarries are defined by their geology and have steep sandstone cliffs that demonstrate past mining activities, such as visible markings of delaminated sandstone and drill holes.

- The McGilvray Quarry no longer contains any standing structures and has been recorded as an archaeological site (CA-COL-182) with at least five features that reflect past mining activities. The Knowles Quarry was recorded as part of the NODOS built environment study (Jimenez, 2013). This quarry contains several modular outbuildings that are not related to its historic past. However, both quarries are defined by their geology and have steep sandstone cliffs that demonstrate past mining activities, such as visible markings of delaminated sandstone and drill holes, and the general area has retained its integrity of location, setting, feeling and association in the rural setting along Stone Corral Creek. These characteristics lend to the delineation of the Stone Corral Creek Quarries Historic District. The quarries are also linked by having operated simultaneously for 17 years and shipped sandstone via the C&LRR. They provided sandstone for the construction of landmark buildings in San Francisco from before the 1906 earthquake (e.g., the Union Depot, the Ferry Building, the St. Francis Hotel, and the James Flood Building), and were significant in the rebuilding of the city post-1906 (e.g., the Gunst Building, three Home Telephone buildings, the W.F. Wood Building, and the Sherith Israel Synagogue). Furthermore, Knowles and McGilvray, both owners of Bay Area stone companies, worked closely with notable architects of the time and successfully marketed Colusa sandstone in San Francisco. McGilvray was also instrumental in the construction of San Francisco City Hall, became president of the San Francisco Builders Exchange, and was Commissioner of the Board of Public Works for the city. Knowles and McGilvray later partnered in granite quarrying in Madera County. Thus the Stone Corral Creek Quarries Historic District appears eligible for the NRHP/CRHR under Criteria A and 1for its contribution to early mining history in the Antelope Valley and to the pre- and post-1906 earthquake construction of significant structural landmarks in San Francisco, and under Criteria B and 2 for its association with Knowles and McGilvray. Although not yet demonstrated, the District may be eligible under Criteria D and 4 for the information regarding sandstone mining technology and mining life that might be contained in archaeological deposits at the quarry sites.

Traditional Cultural Properties

TCPs within the Primary Study Area may include sites, locations, or features that are associated with the cultural practices or beliefs of a living community that are rooted in that community's history, and are essential to maintaining the continuing cultural identity of the community. TCPs are most often associated with Native American practices and beliefs, however, other communities or cultural groups may acknowledge similar properties. TCPs include sites that are an integral aspect of cultural practices or beliefs, or areas where natural materials are gathered to enhance the continuity of cultural traditions, such as basket making supplies.

Currently, no TCPs have been identified within the Primary Study Area. A detailed report on the TCPs within the Primary Study Area will be completed prior to Project construction according to the guidelines of the PA. Furthermore, potential TCP resources that are identified would be evaluated for NRHP/CRHR eligibility pursuant to the PA protocols, and mitigation measures would be applied, as appropriate.

18.3 Environmental Impacts/Environmental Consequences

18.3.1 Regulatory Setting

Cultural resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable cultural resource regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

18.3.1.1 Federal Plans, Policies, and Regulations

- Antiquities Act of 1906
- Archaeological Resources Protection Act
- National Historic Preservation Act of 1966
- National Register of Historic Places
- Protection of Historic Properties (USC 36 CFR part 800)
- Native American Graves Protection and Repatriation Act

18.3.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act
- California Public Resources Code §5097.5
- California Register of Historical Resources
- California Native American Historic Resource Protection Act
- California Public Resources Code §5024.1
- California Public Resources Code §5097.9 to §5097.991
- California Health and Safety Code §7050.5: Disturbance of Human Remains
- Sections 8010–8011 of the California Health and Safety Code: California Native American Graves Protection and Repatriation Act

18.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

Cultural resources that are eligible for listing on the CRHR are collectively referred to as “historical resources,” while those eligible for the NRHP are identified as “historic properties.” Because the eligibility criteria are essentially the same and all resources eligible for the NRHP are also eligible for the CRHR, the term “historical resources” is used in this chapter to refer to cultural resources that have been determined eligible for the CRHP, the NRHP, or both.

18.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for cultural resources:

Would the Project:

- Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?
- Disturb any human remains, including those interred outside of formal cemeteries?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A substantial adverse change in the significance of an archaeological resource pursuant to §15064.5.
- A substantial adverse change in the significance of a historical resource of the built environment as defined in §15064.5.
- Disturb a Traditional Cultural Property.
- Disturb any human remains, including those interred outside of formal cemeteries.

18.3.3 Impact Assessment Assumptions and Methodology

18.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to cultural resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational activities would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water to supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.
- Project construction, operation, and/or maintenance impacts can be direct, indirect, or cumulative. Direct impact examples include destruction of a NRHP/CRHR-eligible building or structure, or mechanical trenching through a significant archaeological site. An example of an indirect impact is providing increased access to an area that contains significant resources that may be subject to looting or vandalism.
- Construction of Project facilities has the potential to impact prehistoric and historic-era archaeological sites that are eligible for listing on the CRHR and the NRHP. This includes not-yet-identified archaeological sites that are buried and cannot be observed on the ground surface. Project construction activities that could disturb such resources would include, but not be limited to, ground-disturbing activities, such as clearing and grubbing, excavation, pipeline installation, backfilling, road and parking lot construction, well drilling, installation of amenities, inundation, and site revegetation.
- The built environment includes buildings and other structures, such as bridges and pumping facilities, and features like roads, canals, ditches, levees, and power lines. Any of these types of resources has the potential to meet the eligibility criteria for listing on the NRHP and the CRHR. Project construction activities could cause the demolition of eligible resources reflecting the built environment. Furthermore, construction or maintenance activities could modify elements that contribute to the eligibility of a particular resource.
- TCPs are tangible locations that are important to the cultural continuity of a community and have been important for more than 50 years, and also meet the criteria for eligibility for listing in the CRHR and the NRHP. TCPs can be archaeological or built environment resources, or they can be features of the natural landscape. Project construction activities that disturb the ground, such as clearing and grubbing, excavation, backfilling, road and parking lot construction, well drilling, installation of amenities, inundation, and site revegetation may impact TCPs. Similarly, demolition or modification of built environment resources may affect TCPs of that nature.
- Cemeteries are often marked by fencing or grave markers, or both. They may also be unmarked. Cemeteries are generally not considered eligible for listing on the CRHR or NRHP because it is often difficult to objectively apply the eligibility criteria without imbuing sentiment or "a sense of reverence" (Potter and Boland, 1992). However, some cemeteries can be considered for listing if one or more of the eligibility criteria, along with special criteria considerations, are met. Eligibility criteria considered for the listing of cemeteries are the same as those considered for any property. Project ground-disturbing activities, such as clearing and grubbing, excavation, backfilling, well drilling, road and parking lot construction, installation of pipelines and amenities, inundation, and site revegetation may impact cemeteries and burial places, both marked and unmarked, that meet the eligibility criteria for inclusion in the CRHR and the NRHP.

18.3.3.2 Methodology

The methodologies used to identify the range of cultural resources that could be potentially affected in the Primary Study Area are described in Section 18.2.1.3. Methods included a record search at the NWIC and the NEIC of the CHRIS, extensive archaeological survey of the Primary Study Area, and an inventory and evaluation of built environment resources located outside of the proposed Sites Reservoir Inundation Area.

The results of the cultural resources studies were compared with footprints of proposed Project facilities. This comparison identified the number of known archaeological sites and built environment resources that would be affected by the Project. Because their NRHP/CRHR eligibility has not yet been determined, the impact assessment for these resources assumes that at least some of the sites will be eligible. Built environment resource impact assessments were made for those resources that had been evaluated for the NRHP and the CRHR.

18.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

18.3.5 Impacts Associated with the No Project/No Action Alternative

18.3.5.1 Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to historical resources has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on historical resources or historic properties that are archaeological sites, when compared to Existing Conditions.

Modeling results indicate that implementation of the No Project/No Action alternative would result in negligible or minor changes to water level fluctuations currently experienced in San Luis Reservoir, Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake; it is expected that Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma would continue to operate as regulating reservoirs, and therefore, continue to experience water level fluctuations. Modeling results indicate changes in the flow regimes of the rivers, creeks, and bypasses, and changes in inflow to the bays included in the Secondary Study Area ranging from negligible to noticeably increased or decreased. Regardless of the level of change, even minor water level fluctuations and flow regime changes have the potential to impact significant archaeological sites, and complete assessment of the effects of reservoir fluctuations and flow regime changes on cultural resources has never been conducted. However, because current operations were established prior to the passing of laws (e.g., NHPA) and their implementing regulations that protect cultural resources, **there would not be a substantial adverse effect** on NRHP/CRHR-eligible archaeological resources by the continued operation of these reservoirs and streams, when compared to Existing Conditions.

Population growth is expected to continue in California regardless of water availability. Development in local communities is addressed on a project-by-project basis at the local level. As a result, **there would not be a substantial adverse effect** on NRHP/CRHR-eligible to archaeological resources associated with population growth if the No Project/No Action Alternative is implemented, when compared to Existing Conditions.

Because ground-disturbing activities associated with the Project would not occur if the No Project/No Action Alternative is implemented, archaeological resources would not be directly affected, and **there would not be a substantial adverse effect** associated with the Project in the three study areas, when compared to Existing Conditions.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Refer to the **Impact Cul-1** discussion. It would also apply to historical resources of the built environment.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. It would also apply to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. It would also apply to finds of human remains.

18.3.6 Impacts Associated with Alternative A

18.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, and Wildlife Refuge Water Use

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

No impact on archaeological resources would occur due to Project construction because no Project facilities would be constructed in the Extended Study Area. Water level fluctuations associated with changes in water deliveries to agricultural, municipal, industrial, and wildlife refuge users have the potential to impact significant archaeological sites, and because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted, it is possible that there could be a **potentially significant impact** to archaeological resources that are historical resources or historic properties by the continued operation of those areas, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Changes in system operation due to the Project, resulting in increased reliability to agricultural and municipal, and industrial water users, and an alternate supply to wildlife refuge users, would have no impact on built environmental features that currently exist. In addition, there are no built environment features located within the managed wetlands of the wildlife refuges. Therefore, **no impact** on historical resources or historic properties of the built environment would occur, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. It would also apply to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. It would also apply to finds of human remains.

San Luis Reservoir

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Fluctuating water elevations have been a part of annual operations at San Luis Reservoir since the facility began operating in the late 1960s. A complete assessment of the effects of reservoir fluctuations on cultural resources has never been conducted because the facility was constructed prior to development of the implementing regulations for Section 106 of the NHPA, and Reclamation is not required to conduct such an assessment pursuant to the existing reservoir operations standards. Both prehistoric and historic-era archaeological resources are known to exist within the reservoir footprint, but comprehensive studies have not been undertaken and the total number of resources present is unknown, nor have ethnographic studies occurred. Increased surface water level fluctuations and more severe drawdowns at the San Luis Reservoir have the potential to impact known and unknown archaeological resources. Furthermore, assuming the reoperation of the reservoirs constitute an undertaking pursuant to Section 3017 of the NHPA, compliance with Section 106 would be required. Therefore, Alternative A operations could result in a **potentially significant impact** to archaeological resources as defined in §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative. Construction and maintenance activities would not occur as a result of this project component, and therefore, would have **no impact** on NRHP/CRHR-eligible archaeological sites, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

No built environment resources are known to remain within the reservoir footprint; therefore, there would be no impact to NRHP/CRHR-eligible, historic-era built environment resources as the result of increased surface water level fluctuations and more severe drawdowns at the San Luis Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, no Project construction or maintenance activities would occur within the reservoir; therefore, **no impact** on historic-era built environment structures would occur, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

No TCPs are currently known to exist around San Luis Reservoir. However, operations of Alternative A could have a **potentially significant impact** to TCPs, when compared to Existing Conditions and the No Project/No Action Alternative, if they are found at the reservoir. It is anticipated that there will be **no impact** to TCPs from construction and maintenance activities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion for San Luis Reservoir. Both prehistoric and historic-era archaeological resources are known to exist within the reservoir pool, but comprehensive studies have not been undertaken; as a result, it is not known if any cemeteries exist within the reservoir pool. Increased surface water level fluctuations and more severe drawdowns at the San Luis Reservoir have the potential to cause erosion and expose burial locations. Implementation of Alternative A may, therefore, result in a **potentially significant impact** to human remains at San Luis Reservoir, when compared to Existing Conditions and the No Project/No Action Alternative.

18.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex, Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

The minimal Project construction identified for the Secondary Study Area would be limited to the installation of a pump into an existing feature of the built environment at the Red Bluff Pumping Plant, where no ground disturbance is expected to occur. Therefore, compared to Existing Conditions and the No Project/No Action Alternative, there would be **no impact** to significant archaeological resources that are historical resources or historic properties as the result of construction activities in the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative. There would also be **no impact** to NRHP/CRHR-eligible archaeological resources from changes in operations because no ground disturbance is expected to occur during that Project phase, when compared to Existing Conditions and the No Project/No Action Alternative.

Operational modifications would occur at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake within the Secondary Study Area to achieve the benefits associated with the Project, and would primarily include the retention of water in these reservoirs during drought years while water is released from Sites Reservoir. Overall, however, reservoir fluctuations would be reduced, and therefore, would not exceed those that occur during current operations. A comprehensive archaeological survey was conducted within the fluctuation zone at Lake Oroville, and over 400 archaeological resources were recorded (Walker and Delacorte, 2010). Similarly, an ethnographic study was conducted of the Lake Oroville area and nearly 60 resources important to the local Maidu community were identified within the footprint of the reservoir

(McCarthy, 2004); many of these resources appear eligible for the NRHP as contributors to two TCP complexes that include portions of the reservoir area (McCarthy, 2009).

Similar to San Luis Reservoir, a complete assessment of the effects of reservoir fluctuations on cultural resources has never been conducted at Trinity, Shasta, and Folsom lakes because the facilities were constructed prior to development of the implementing regulations for Section 106 of the NHPA, and Reclamation is not required to conduct such an assessment pursuant to the existing reservoir operations standards. Both prehistoric and historic-era archaeological resources are known to exist within the reservoir footprints, but comprehensive studies have not been undertaken and the total number of resources present is unknown, nor have ethnographic studies occurred. However, drawdowns are not anticipated to exceed those that currently take place, and reservoir fluctuations would be reduced.

In addition, it is expected that Lewiston Lake, Whiskeytown Lake, Keswick Reservoir, the Thermalito Complex, and Lake Natoma would continue to operate as regulating reservoirs and would, therefore, continue to experience water level fluctuations. Modeling results indicate changes in the flow regimes of the rivers, creeks, and bypasses, and changes in inflow to the bays included in the Secondary Study Area ranging from negligible to noticeably increased or decreased. These minor water level fluctuations and flow regime changes would fall within the historic range of operations for these regulating reservoirs. Therefore, Alternative A operations would result in a **less-than-significant impact** to archaeological resources as defined in §15064.5 and TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities related to the Secondary Study Area would involve the removal of sediment from the existing two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant). Removed sediment would be placed in areas previously used for the deposit of fill materials. Maintenance activities would, therefore, have **no impact** to significant archaeological resources pursuant to §15064.5 for the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Direct Project-related construction for the Secondary Study Area would be limited to the installation of an additional pump into an existing bay at the RBPP. The T-C Canal Intake at the pumping plant was constructed in the late 1960s and has been continually modified and maintained over the years. Although the intake does not meet the 50-year-old requirement necessary to be considered a historical resource, the intake would need to be recorded as a built environment feature. There would be **no impact** to built environment resources that are eligible to the CRHR or the NRHP as the result of construction, operation, and maintenance activities for the Secondary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. It would also apply to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. It would also apply to finds of human remains.

18.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area and Sites Reservoir Dams

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Construction of the proposed Sites Reservoir and dams would impact 57 known archaeological sites and 197 archaeological isolates, primarily through clearing and grubbing, and filling the reservoir. Portions of the reservoir footprint have not been surveyed due to lack of access, and those acres would require survey prior to construction; therefore, additional archaeological sites may be identified. There is also a possibility that archaeological resources that are not visible on the ground surface may be uncovered during Project construction. None of the recorded sites have yet been evaluated for eligibility to the CRHR or the NRHP. Until these studies are completed, it is expected that the construction, operation, and maintenance of the 1.27-MAF Sites Reservoir, the Golden Gate and Sites dams, and the seven saddle dams would result in a **potentially significant impact** on archaeological sites pursuant to §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Nineteen residential dwellings, 15 ranch compounds, and 27 miscellaneous outbuildings are located within the proposed footprint of the Sites Reservoir and dams. None of these structures have been formally recorded or evaluated for eligibility to the CRHR or the NRHP.

Maxwell Sites and Sites Lodoga roads have existed for well over 100 years, and Huffmaster and Peterson roads may be of similar age. All of these roads would be at least partially inundated by development of Sites Reservoir. The age of the roads qualifies them as cultural resources that require evaluation for eligibility to the NRHP and the CRHR; these evaluations have not yet occurred. If any of the buildings or roads within the 1.27-MAF Sites Reservoir and associated dams footprint are determined to be eligible for listing in the NRHP or the CRHR, inundation could have a **potentially significant impact** on built environment resources pursuant to §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative. Because all structures would be removed from the Sites Reservoir footprint, **no impact** on NRHP/CRHR-eligible, built environment resources would occur during Project operation and maintenance activities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

No TCPs have been identified within the proposed Sites Reservoir and dam areas, to date; however, ethnographic studies have not yet been undertaken. The construction, operation, and maintenance of the 1.27-MAF Sites Reservoir and dams could result in a **potentially significant impact** to TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Two cemeteries are known to exist within the inundation area of the proposed Sites Reservoir. Evidence also indicates that there are likely unmarked cemeteries or burial places associated with Native American sites (prehistoric, ethnohistoric, and historic-era) within the reservoir area (White et al., 2009). As a result, the filling of Sites Reservoir and its operation and maintenance may have a **potentially significant**

impact on cemeteries that are historical resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Each of the five proposed recreation areas was included in the Sites Reservoir archaeological survey area (White et al., 2009), but two archaeological sites were identified at only the Peninsula Hills Recreation Area. However, buried archaeological remains may be present at any of the five recreation areas, when compared to Existing Conditions or the No Project/No Action Alternative. The known sites have not yet been evaluated for eligibility to the CRHR or the NRHP. The construction, operation, and maintenance of the recreation areas may result in a **potentially significant impact** to significant archaeological resources that are eligible for the CRHR or the NRHP, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

No resources of the built environment are present at any of the five proposed recreation locations; therefore, Project construction, operation, and maintenance would have **no impact** to historical resources or historic properties of the built environment as defined in §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

No TCPs are known to exist at any of the proposed recreation areas; however, ethnographic studies have not yet been undertaken. The construction, operation, and maintenance of the recreation areas could result in a **potentially significant impact** on TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Formal cemeteries are not present at any of the five proposed recreation areas. It is possible, however, that unmarked cemeteries or burial locations may be present. As a result, the construction, operation, and maintenance of the recreation areas may result in a **potentially significant impact** to human remains, when compared to Existing Conditions and the No Project/No Action Alternative.

Road Relocations and South Bridge

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Construction of 46 miles of new public and private access roads (including associated detours and construction roads and all appurtenant features, such as culverts, fences, and guardrails) and the proposed South Bridge have the potential to impact nine known archaeological sites, none of which have been evaluated for eligibility to the CRHR or the NRHP. An additional four sites are located in proximity to the road footprints and have the potential for being impacted during construction activities. Unknown buried archaeological sites may also be present. Furthermore, the proposed asphalt batch plant location adjacent the proposed Field Office Maintenance Yard has not yet been surveyed; its construction may impact significant archaeological resources.

None of the known archaeological sites have been evaluated for eligibility to the CRHR or the NRHP; thus, when compared to Existing Conditions or the No Project/No Action Alternative, Project construction for proposed road relocations (including the asphalt batch plant) and South Bridge may have a **potentially significant impact** on archaeological resources as defined in §15064.5. Operation and maintenance of the new roads would have **no impact** to NRHP/CRHR-eligible archaeological sites, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Built environment resources are not located within the footprint of the proposed road relocations; therefore, there would be **no impact** to historical resources or historic properties of the built environment, when compared to Existing Conditions and the No Project/No Action Alternative, due to road relocations or the construction, operation, or maintenance of South Bridge.

Impact Cul-3: Disturb a Traditional Cultural Property

Ethnographic studies have not been conducted for the proposed Project, so it is not known if TCPs are located along proposed routes for the road relocations or for South Bridge. Until those studies are complete, the construction, operation, and maintenance of the new roads may have a **potentially significant impact** on TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

No marked cemeteries are located within the footprints of the proposed road relocations or for South Bridge. It is possible, however, that currently undetected buried human remains are present along the routes; therefore, construction, operation, and maintenance of the new roads could have a **potentially significant impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

The proposed Sites Pumping/Generating Plant and the Sites Reservoir Inlet/Outlet Structure locations, the Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, the Sites Electrical Switchyard, and the Field Office Maintenance Yard locations have not been surveyed and may contain archaeological sites. Buried archaeological deposits may be present at any of these locations. Therefore, a **potentially significant impact** to archaeological sites that are historical resources or historic properties may result during construction of these facilities, when compared to Existing Conditions or the No Project/No Action Alternative. Operation and maintenance of the Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir

Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard would have **no impact** on significant NRHP/CRHR-eligible archaeological resources, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

One resource of the built environment, the Funks Reservoir Farmstead, is located, in the vicinity of the proposed Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, the Sites Electrical Switchyard, and the Field Office Maintenance Yard. This resource was evaluated and does not appear to be eligible for listing on the NRHP/CRHR. As a result, construction of these facilities would have **no impact** to historical resources or historic properties of the built environment pursuant to §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative. Because there are no NRHP/CRHR-eligible built environment resources in the vicinity, operation and maintenance of the Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard would have **no impact** on built environment resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

No TCPs have been identified within the proposed Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, the Sites Electrical Switchyard, and the Field Office Maintenance Yard to date; however, ethnographic studies have not yet been undertaken. The construction, operation, and maintenance of these facilities could result in a **potentially significant impact** to TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Formal cemeteries are not present within the footprints of the proposed Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and the Field Office Maintenance Yard; however, the possible presence of unmarked burial locations cannot be discounted. The construction of these facilities could have a **potentially significant impact** on unmarked human remains, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the Sites Pumping/Generating Plant, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Sites Electrical Switchyard, and Field Office Maintenance Yard would have **no impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

A record search was recently conducted of the proposed Holthouse Reservoir Complex area, which includes the location of the Holthouse Reservoir Electrical Switchyard, by the NWIC of the CHRIS at Sonoma State University. The record search did not identify any previously recorded resources within the Holthouse Dam and Reservoir footprint, but it indicated that the Holthouse Reservoir Complex is entirely within the limits of a survey conducted for the T-C Canal in 1965 (Treganza et al., 1965).

The footprint of the existing Funks Reservoir was inventoried and documented by Chartkoff (1969) and West et al. (1976) prior to construction and filling of the reservoir. Three prehistoric and one historic-era archaeological sites were identified and recorded during those efforts: CA-COL-233 (previously designated as Funks Creek 1 and Chartkoff-COL-28), CA COL-242 (previously designated as Funks Creek 2 and Chartkoff-COL-37), CA COL 53 (previously designated as Funks Creek 3), and CA-COL-27H (previously designated 4-Col-27).

Intensive artifact collection and limited trenching were conducted at the three prehistoric sites at Funks Reservoir, and additional excavation was conducted at CA-COL-242 and CA-COL-53. The studies revealed that the sites were recent prehistoric non-midden surface artifact scatters. Due to the nature of the sites and the low yield of subsurface artifacts obtained through excavation and trenching, it was determined that the probability of discovering additional subsurface artifacts was very low. It was concluded that the sites retained no opportunity to provide additional knowledge to the understanding of history or prehistory, and, as a result, they were determined not eligible for inclusion in the NRHP. These sites are, therefore, similarly ineligible to the CRHR.

CA-COL-27H was a cabin with several historic-era items, including a sewing machine, stove fragments, tableware and other miscellaneous household items, and remnants of outbuildings. The site reflected occupation between 1890 and 1916. An evaluation by West et al. (1976) determined that the site was not eligible for inclusion in the NRHP. The cabin no longer exists.

Initial surveys of the Holthouse Reservoir Complex have failed to identify any archaeological resources. However, sites may exist in portions of the facility footprint that remain to be surveyed, or may be completely buried and invisible on the ground surface. As a result, construction and operation of the Holthouse Reservoir Complex and the Holthouse Reservoir Electrical Switchyard, when compared to Existing Conditions or the No Project/No Action Alternative, could have a **potentially significant impact** to archaeological sites pursuant to §15064.5.

Although known archaeological sites within the Funks Reservoir have been determined ineligible for the CRHR and the NRHP, there is the potential for uncovering buried archaeological remains during the dredging of Funks Reservoir to return it to design capacity. Thus, the dredging activities could have a **potentially significant impact** to NRHP/CRHR-eligible archaeological deposits, when compared to Existing Conditions and the No Project/No Action Alternative, because dredging could occur deeper than planned. Operation and maintenance activities at the Holthouse Reservoir Complex (including Funks Reservoir) could result in a **potentially significant impact** to archaeological resources that are eligible for the CRHR or the NRHP, when compared to Existing Conditions and the No Project/No Action Alternative, because dredging that may occur in the future could occur deeper than planned, exposing or damaging currently buried archaeological deposits.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

The built environment resources within the proposed Holthouse Reservoir Complex are the T-C Canal, Funks Dam, and the WAPA Maxwell-Olinda 500-kVoverhead transmission line, all of which would be decommissioned within the Holthouse Reservoir footprint. The T-C Canal and Funks Dam are not yet 50 years old (and, therefore, not old enough to be considered eligible for the NRHP), but they should be recorded as cultural resources because it will be important to have a record of their locations. Initial construction of the WAPA Transmission Line occurred over 50 years ago; however, the substations at either end of the circuit were not built until 1986. Therefore, the resource does not meet the age criterion for NRHP/CRHR eligibility. The construction, operation, and maintenance of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would, therefore, have **no impact** on built environment historical resources or historic properties, when compared to Existing Conditions and the No Project/No Action Alternative.

Built environment resources are not present within the Funks Reservoir footprint; therefore, the dredging of the reservoir, along with operation and maintenance activities, would have **no impact** on built environment historical resources or historic properties, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-3: Disturb a Traditional Cultural Property

Ethnographic studies have not been conducted for the proposed Project, so it is not known if TCPs are located within the proposed Holthouse Reservoir Complex (including Funks Reservoir). Until those studies are complete, the construction, operation, and maintenance of these new facilities may have a **potentially significant impact** on TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

There are no formal cemeteries within the footprint of the proposed Holthouse Reservoir Complex (including Funks Reservoir and the Holthouse Electrical Switchyard). It is possible, however, that unmarked burials are present. Therefore, construction, operation, and maintenance of the Holthouse Reservoir Complex, including dredging of the existing Funks Reservoir, could have a **potentially significant impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative.

GCID Canal Facilities Modifications

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

White and Crawford (2003a) conducted a record search of the GCID Canal in 2003. The record search identified one prehistoric archaeological site located in proximity to the proposed GCID Canal Facilities Modifications, but no field investigation has been done to verify the site location and to determine whether the Project would impact the resource. It is also possible that buried archaeological sites could be adversely affected by Project activities in the area. Archaeological resources, as defined in §15064.5, could be subject to a **potentially significant impact** from Project construction, when compared to Existing Conditions or the No Project/No Action Alternative. **No impact** would likely occur to NRHP/CRHR-eligible archaeological sites as the result of operation and maintenance activities, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

Built environment resources associated with the proposed GCID Canal Facilities Modifications include the GCID Canal prism, along with the existing appurtenant features (refer to Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives). Most of these features would remain intact, but the California Northern Railroad Siphon structure at Mile 26.6 would be replaced, as would the 1941 headgate located near the GCID pumping station. The siphon and headgate and canal prism were evaluated for NRHP/CRHR eligibility. The siphon was built in 1917 as part of the original Central Irrigation Canal and is a unique structure designed to move canal water underneath the railroad bridge. The siphon, therefore, appears to be individually eligible for the NRHP/CRHR and is a contributing element to the GCID Canal as a whole. On the other hand, the headgate was constructed in 1941 and the adjacent canal prism was modified at the same time. These actions occurred outside of the period of significance for the GCID Canal, and because the headgate and canal prism are not significant engineering structures, the headgate and prism at this location are not considered eligible for the NRHP/CRHR either individually or as part of the GCID Canal proper. Because the California Northern Railroad Siphon appears eligible for inclusion to the NRHP and the CRHR, Project construction would have a **potentially significant impact** on historical resources or historic properties of the built environment, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance would have **no impact** on these same resources, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-3: Disturb a Traditional Cultural Property

Proposed Project construction would be concentrated within the GCID Canal, with an additional 50-foot buffer to each side. The Canal is not a TCP; therefore, there would be **no impact** to TCPs during construction, operation, and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Formal cemeteries do not exist within the proposed GCID Canal Facilities Modifications footprint. However, it is remotely possible that unrecorded burials may be located within the 50-foot construction buffer, and that Project construction would have a **potentially significant impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance activities would have **no impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Delevan Transmission Line, Delevan Pipeline, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Pipeline Intake Facilities

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

An archaeological study for the proposed Delevan Pipeline and Delevan Pipeline Intake Facilities involved a record search and a partial field inventory of the facility footprints east of I-5 (Westwood and White, 2005). Three isolated historic-era features were recorded: ISO-030-A (a palm tree stump); ISO-031-A (remnants of a pumping station in an abandoned canal); and immediately adjacent, ISO-032-A (a water outlet and control gate). The record search included the areas covered by the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Pipeline Intake Facilities. No previously recorded archaeological resources were identified in the facility footprints by the search. Along with all of the Delevan Pipeline west of I-5 (and some portions of the Delevan Pipeline east of the freeway), none of these latter facilities have been subject to archaeological survey. The lack of surveys, together with the potential for buried sites, indicates that Project construction could result in a **potentially significant impact** to archaeological resources pursuant to §15064.5, when compared to Existing Conditions or the No Project/No Action Alternative. Operation and maintenance of these facilities would have **no impact** on historical resources or historic properties that are archaeological sites, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5

In addition to the two historic-era isolates noted above (ISO-031-A and ISO-032-A), built environment resources within or adjacent to the footprints of the proposed TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Pipeline Intake Facilities include a portion of the GCID Canal, two McDermott Road farmsteads, the CBD, the Sacramento River levee, and the MID Canal. Isolates are generally not considered potentially eligible resources due to their limited ability to fulfill the NRHP/CRHR eligibility criteria. An evaluation of the GCID Canal and the CBD suggests that the resources are eligible for the NRHP and the CRHP under Criteria A and C, and 1 and 3, respectively. The Sacramento River levee similarly appears eligible for the NRHP/CRHR under criteria A/1. Conversely, neither of the McDermott Road farmsteads appears to meet the eligibility criteria because the buildings present either do not meet the age criteria for eligibility consideration, or they lack integrity and are not exceptional examples of an architectural type. The MID Canal also does not appear to be an eligible resource. The presence of the GCID Canal, the CBD, and the Sacramento River levee indicates that Project construction may have a **potentially significant impact** on a historical resource or historic property of the built environment, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance activities associated with these facilities would have **no impact** on NRHP/CRHR-eligible built environment resources, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-3: Disturb a Traditional Cultural Property

It has not yet been determined if TCPs are within the proposed TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Pipeline Intake Facilities areas. Therefore, it is possible that construction, activities could have a **potentially significant impact** to TCPs, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance tasks would have **no impact** to TCPs, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

There are no formal cemeteries within the footprints for these proposed facilities, but the presence of unrecorded burials is possible. As a result, construction of the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, GCID Canal Connection to the TRR, Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and Delevan Pipeline Intake Facilities could have a **potentially significant impact** on human remains, when compared to Existing Conditions and the No Project/No Action Alternative. There would be **no impact** to human remains due to operation and maintenance activities, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Project Buffer

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Most of the proposed Project Buffer was included in the Sites Reservoir archaeological survey area (White et al., 2009). Twenty-eight known archaeological sites and 33 archaeological isolates have been recorded within the Project Buffer and outside of the construction elements described above. Portions of the Project Buffer have not been surveyed due to late identification of this project feature. It is, therefore, possible that other archeological sites, in addition to buried archaeological remains, may be present within this area. Activities within the Project Buffer could include fence construction or creation of mitigation lands. The presence of known sites and lack of complete surveys, combined with the possibility of ground-disturbing construction, operation, or maintenance activities, indicates the possibility of a **potentially significant impact** to significant archaeological resources that are eligible for the CRHR or the NRHP, when compared to Existing Conditions or the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

The built environment study identified four resources within the proposed Project Buffer: Huffmaster Road Farmstead (1), Huffmaster Road Farmstead (2), County Road 69 Farmstead, and the Stone Corral Creek Quarries Historic District. The Stone Corral Creek Quarries Historic District appears to be NRHP/CRHR-eligible for its contribution to the early mining history of Antelope Valley and the construction of significant landmark buildings in San Francisco, and for its association with prominent

Bay Area business men. None of the three farmsteads appears eligible for the NRHP or the CRHR because the buildings they contain are not old enough to be considered for NRHP/CRHR eligibility, or lack integrity and are not exceptional examples of an architectural style. The presence of the Stone Corral Creek Quarries Historic District suggests that the Project Buffer could have a **potentially significant impact** on built environment resources pursuant to §15064.5, when compared to Existing Conditions and the No Project/No Action Alternative. There would be **no impact** on the NRHP/CRHR-eligible built environment resources from operation and maintenance activities, when compared to Existing Conditions and the No Project/No Action Alternative, because any impacts to those resources would have been mitigated during construction.

Impact Cul-3: Disturb a Traditional Cultural Property

Ethnographic studies have not been conducted for this proposed Project feature, so it is not known if TCPs are located within the proposed Project Buffer. Until those studies are complete, any ground-disturbing construction, operation, or maintenance activities may have a **potentially significant impact** on TCPs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Formal cemeteries are not present within the proposed Project Buffer. It is possible, however, that unmarked cemeteries or burial locations may be present. As a result, any ground-disturbing construction, operation, or maintenance activities within the Proposed Take Line may result in a **potentially significant impact** to human remains, when compared to Existing Conditions and the No Project/No Action Alternative.

18.3.7 Impacts Associated with Alternative B

18.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to archaeological resources (**Impact Cul-1**), historic-era resources of the built environment (**Impact Cul-2**), TCPs (**Impact Cul-3**), and human remains (**Impact Cul-4**), would be the same as described for Alternative A for the Extended and Secondary study areas.

18.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to cultural resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard

- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on archaeological resources (**Impact Cul-1**), historic-era resources of the built environment (**Impact Cul-2**), TCPs (**Impact Cul-3**), and human remains (**Impact Cul-4**) as described for Alternative A.

The major differences between Alternatives B and A are related to the increased size of the Sites Reservoir with Alternative B. The increase in reservoir size necessitates the addition of two saddle dams and the movement of various project components. In addition, Alternative B replaces the Delevan Pipeline Intake Facilities with the Delevan Pipeline Discharge Facility, and shortens the Delevan Transmission Line. The Alternative B facilities' construction impacts on cultural resources that would differ from those described for Alternative A are discussed below.

Sites Reservoir Inundation Area (1.81 MAF) and Sites Reservoir Dams

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Construction of a 1.81-MAF Sites Reservoir, the Golden Gate and Sites dams, and nine saddle dams would have similar impacts on archaeological resources; the primary difference would be that 70 known archaeological sites have been recorded within the footprint of these larger facilities, rather than the 57 resources affected by Alternative A. Similarly, 230 archaeological isolates are within the footprint of the larger reservoir. As a result, Alternative B would have a **potentially significant impact** on NRHP/CRHR-eligible archaeological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

Refer to the **Impact Cul-1** discussion. That discussion also applies to historic-era resources of the built environment.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. That discussion also applies to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. That discussion also applies to human remains.

Road Relocations and South Bridge

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Effects on archaeological resources from construction associated with road relocations and the South Bridge for Alternative B would be similar to the impacts described for Alternative A. However, excavations for this alternative would differ from Alternative A. The lengths of the saddle dam access roads would be reduced for Alternative B because the dams would be larger and would be located closer to the main roads. This would, therefore, reduce the potential impacts on archaeological resources in those areas. However, an extension of an access road would be constructed for Alternative B to provide access from Saddle Dam 3 to Saddle Dams 1 and 2, which has the potential to impact archaeological resources that would not be affected by Alternative A. Alternative B would have a **potentially significant impact** on NRHP/CRHR-eligible archaeological resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

Refer to the **Impact Cul-1** discussion. That discussion also applies to historic-era resources of the built environment.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. That discussion also applies to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. That discussion also applies to human remains.

Delevan Transmission Line

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

The proposed Delevan Transmission Line from the Sites Electrical Switchyard to its connection with the existing WAPA or PG&E transmission lines would be shorter than the transmission line included in Alternative A. This reduced length would potentially result in impacts to fewer archaeological resources, historic-era resources of the built environment, TCPs, and human remains, but would still result in a **potentially significant impact** on NRHP/CRHR-eligible archaeological resources, historic-era resources of the built environment, TCPs, and human remains, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

Refer to the **Impact Cul-1** discussion. That discussion also applies to historic-era resources of the built environment.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. That discussion also applies to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. That discussion also applies to human remains.

Delevan Pipeline Discharge Facility

Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5

Impacts to NRHP/CRHR-eligible archaeological resources, historic-era resources of the built environment, TCPs, and human remains would be similar to those discussed for Alternative A. However, the smaller size of this facility, when compared to the Delevan Pipeline Intake Facilities that are included in Alternative A, could potentially lessen the number of archaeological resources, historic-era resources of the built environment, TCPs, and human remains that would be affected. Despite the reduced potential effect, construction of this facility would still result in a **potentially significant impact** on historical resources and historic properties.

Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as defined in §15064.5

Refer to the **Impact Cul-1** discussion. That discussion also applies to historic-era resources of the built environment.

Impact Cul-3: Disturb a Traditional Cultural Property

Refer to the **Impact Cul-1** discussion. That discussion also applies to TCPs.

Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries

Refer to the **Impact Cul-1** discussion. That discussion also applies to human remains.

18.3.8 Impacts Associated with Alternative C

18.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to archaeological resources (**Impact Cul-1**), historic-era resources of the built environment (**Impact Cul-2**), TCPs (**Impact Cul-3**), and human remains (**Impact Cul-4**) would be the same as described for Alternative A for the Extended and Secondary study areas.

18.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to cultural resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The boundary of the Project Buffer would be the same for all three alternatives, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

The Alternative C design of the Delevan Pipeline Intake Facilities and Delevan Transmission Line is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to cultural resources as described for Alternative A.

The Alternative C design for the Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge would be the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to cultural resources as described for Alternative B.

18.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 18-2 for the impacts that have been identified as significant or potentially significant.

Table 18-2
Summary of Mitigation Measures for
NODOS Project Impacts to Cultural Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Cul-1: A Substantial Adverse Change in the Significance of an Archaeological Resource Pursuant to §15064.5	All Primary Study Area Project Facilities	Potentially Significant	Mitigation Measure Cul-1a: Avoid Impacts to Historical Resources/Historic Properties	No Impact
			Mitigation Measure Cul-1b: Conduct Archaeological Data Recovery	Less than Significant
			Mitigation Measure Cul-1c: Immediately Halt Construction if Cultural Resources are Discovered and Implement an Accidental Discovery Plan	Less than Significant
			Mitigation Measure Cul-1d: Protection of Archaeological Sites by Capping	Less than Significant
	Sites Reservoir, San Luis Reservoir, and Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use	Potentially Significant	Mitigation Measure Cul-1e: Develop Agreement Documents to Address Potential Future Operational Impacts to Cultural Resources	Less than Significant or Significant and Unavoidable
Impact Cul-2: A Substantial Adverse Change in the Significance of a Historical Resource of the Built Environment as Defined in §15064.5	Sites Reservoir Inundation Area, GCID Canal Facilities Modifications, TRR and associated TRR Facilities, Delevan Pipeline, Delevan Pipeline Intake/Discharge Facilities, and Project Buffer	Potentially Significant	Mitigation Measure Cul-1a: Avoid Impacts to Historical Resources	No Impact
			Mitigation Measure Cul-2a: Follow the Secretary of the Interior's Standards for the Treatment of Historical Resources/Historic Properties	Less than Significant
			Mitigation Measure Cul-2b: Record Built Environment Resources to Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) Standards	Significant and Unavoidable if eligible for CRHR or NRHP listing

Table 18-2
Summary of Mitigation Measures for
NODOS Project Impacts to Cultural Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Cul-3: Disturb a Traditional Cultural Property	San Luis Reservoir and Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use	Potentially Significant	Mitigation Measure Cul-1e: Develop Agreement Documents to Address Potential Future Operational Impacts to Cultural Resources	Less than Significant or Significant and Unavoidable
	All Primary Study Area Project Facilities except for the GCID Canal Facilities Modifications	Potentially Significant	Mitigation Measure Cul-1a: Avoid Impacts to Historical Resources	No Impact
			Mitigation Measure Cul-3: Consult with Native American Communities regarding How to Mitigate for Impacts to TCPs	Less than Significant; or Significant and Unavoidable for some categories of TCPs
Impact Cul-4: Disturb Human Remains, including those Interred Outside of Formal Cemeteries	San Luis Reservoir and Agricultural, Municipal, Industrial, and Wildlife Refuge Water Use	Potentially Significant	Mitigation Measure Cul-1e: Develop Agreement Documents to Address Potential Future Operational Impacts to Cultural Resources	Less than Significant or Significant and Unavoidable
	All Primary Study Area Project Facilities	Potentially Significant	Mitigation Measure Cul-1a: Avoid Impacts to Historical Resources	No Impact
			Mitigation Measure Cul-4a: Relocation of Known Cemeteries	Less than Significant
			Mitigation Measure Cul-4b: Immediately Halt Construction if Human Remains are Discovered and Implement a Burial Treatment Plan	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Cul-1a: Avoid Impacts to Historical Resources/Historic Properties

If feasible, impacts to identified historical resources/historic properties, including prehistoric and historic-era archaeological sites, buildings and structures, TCPs, and human remains shall be avoided. Methods of avoidance may include, but are not limited to, Project re-design, or, when appropriate, deeding the site into a permanent conservation easement; incorporation of sites into parks, greenspace, or other open space; and protection measures, such as fencing.

Mitigation Measure Cul-1b: Conduct Archaeological Data Recovery

If it is infeasible to avoid impacts to archaeological sites that have been determined to be eligible for listing on the CRHR or the NRHP, additional research including, but not necessarily limited to, archaeological excavation shall be conducted. This work shall be directed by a qualified archaeologist who meets the U.S. Secretary of Interior's professional standards, and shall include preparation of a research design; additional archival and historical research to supplement the research design, when appropriate; archaeological excavation; analysis of artifacts, features, and other attributes of the resource; and preparation of a technical report documenting the methods and results of the investigation in accordance with the California Office of Historic Preservation Guidelines for Archaeological Research Design (1991). The purpose of this work is to recover a sufficient quantity of data to compensate for damage to or destruction of a resource that is eligible for the CRHR pursuant to criterion 4 of CCR 4852(b) or the NRHP pursuant to 36 CFR 60.4(d). The procedures to be used in this data recovery program shall be determined in consultation with responsible agencies and interested parties such as Native American tribes, as appropriate, within the parameters of the PA.

Mitigation Measure Cul-1c: Immediately Halt Construction if Cultural Resources are Discovered, and Implement an Accidental Discovery Plan

Not all cultural resources are visible on the ground surface. Protocols for addressing the accidental discovery of archaeological resources that are not visible on the ground surface during Project construction will be outlined in an Accidental Discovery Plan, as directed by the PA. If any cultural resources, such as structural features, unusual amounts of bone or shell, flaked or ground stone artifacts, historic-era artifacts, human remains, or architectural remains are encountered during any Project construction activities, work shall be suspended immediately at the location of the find and within an appropriate radius, with a minimum of 50 feet. A qualified archaeologist shall conduct a field investigation of the specific site and recommend mitigation deemed necessary for the protection or recovery of any cultural resource concluded by the archaeologist to represent a historical resource or unique archaeological resource. Mitigation measures shall be developed in consultation with responsible agencies and, as appropriate, interested parties such as Native American tribes. Implementation of the approved mitigation would be required before resuming construction activities at the archaeological site. All of the activities identified above shall be detailed in an Accidental Discovery Plan developed prior to construction so that all parties are aware of the actions required if buried archaeological resources are uncovered during Project construction. Discoveries of human remains shall be treated as described below for Mitigation Measure Cul-4b.

Mitigation Measure Cul-1d: Protection of Archaeological Sites by Capping

Capping archaeological sites that are considered historical resources with soil, gravels, rock, or specific kinds of vegetation can be a viable way to protect the deposits under some circumstances. For example, sites subject to inundation and water level fluctuations may be protected from erosion by applying a layer of gravel/rock (rip-rap), soil, cloth, or some combination of treatments. In such circumstances, regular monitoring would be required to evaluate the efficacy of the mitigation, and to identify if and when it is necessary to refresh the protection. A layer of soil, i.e., sterile fill, might also be placed over a site where construction of a building was planned, such that all construction disturbance would occur in the fill material. Planting vegetation, such as poison oak, wild rose, or blackberry brambles, over the top of a site is a useful deterrent for areas subject to looting.

Mitigation Measure Cul-1e: Develop Agreement Documents to Address Potential Future Operational Impacts to Cultural Resources

Protocols for addressing potential future operations impacts at Sites Reservoir and at existing facilities within the Extended Study Area shall be addressed in the PA. This may include preparation of Memoranda of Agreement for specific facilities and/or development of a Cultural Resources Management Plan, depending on the lead agency in charge of the facility. Management of historical resources/historic properties under such agreement documents might include standard measures for identification of historical resources/historic properties where needed, assessment of project impacts, and application of specific mitigation measures, as well as protocols for resource monitoring or stabilization techniques. Such agreement documents shall be developed in consultation with responsible agencies and interested parties, such as Native American tribes, as appropriate, within the parameters of the PA.

Mitigation Measure Cul-2a: Follow the Secretary of the Interior's Standards for the Treatment of Historical Resources/Historic Properties

Because construction of Project facilities has the potential to modify buildings or structures that are considered historical resources/historic properties, any alterations, including relocation, to historic buildings or structures shall conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties and Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (1995).

Mitigation Measure Cul-2b: Record Built Environment Resources to Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) Standards

If avoidance or relocation of a building or structure that is considered eligible for the CRHR or NRHP is not feasible, and the resource must be demolished, a qualified architectural historian who meets the U.S. Secretary of Interior's professional standards shall be retained to document the impacted historical architectural resource to Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) specifications. HABS and HAER documentation packages shall be entered into the Library of Congress as well as the NWIC or NEIC of the CHRIS.

Mitigation Measure Cul-3: Consult with Native American Communities regarding How to Mitigate for Impacts to TCPs

TCPs are often locations on the landscape that have sacred or other special meaning to Native American communities. Associated characteristics, such as an archaeological deposit, are not always present. Early and meaningful consultation with Native American communities shall occur to identify ways to mitigate impacts to TCPs. Interpretive programs, establishing or enhancing locations for traditional plants, or a visitor's center, are examples of ways to address these important issues. Consultation with Native American communities shall occur.

Mitigation Measure Cul-4a: Relocation of Known Cemeteries

Consultation shall occur with the entity (County, City, private) that has jurisdiction over the cemetery, and interested parties as appropriate, to identify a satisfactory place that is protected from future disturbance for the relocation of human remains. Similarly, if Native American burials are known to exist in an archaeological site, the Project proponent shall work with the appropriate tribe to identify a satisfactory location for re-interment of burials in a protected location.

Mitigation Measure Cul-4b: Immediately Halt Construction if Human Remains are Discovered, and Implement a Burial Treatment Plan

Project construction activities have the potential to have unanticipated significant impacts to buried human remains where there is no surface indication of their presence. In these circumstances, the requirements of California Health and Human Safety Code 7050.5 must be followed. In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the potentially damaging excavation must halt in the area of the remains and the local County Coroner must be notified. The Coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the Coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). Pursuant to the provisions of California Public Resources Code Section 5097.98, the NAHC shall identify a Most Likely Descendent (MLD). The MLD designated by the NAHC shall have at least 48 hours to inspect the site and propose treatment and disposition of the remains and any associated grave goods. All of the activities identified above shall be detailed in a Burial Treatment Plan, as directed by the PA, and developed in consultation with local Native American tribes prior to Project construction so that all parties are aware of the actions required if buried human remains are uncovered during Project construction.

Implementation of **Mitigation Measures Cul-1a, Cul-1b, Cul-1c, Cul-1d, Cul-1e, Cul-2a, Cul-2b, Cul-3, Cul-4a, and Cul-4b** would reduce the level of significance of Project impacts to **no impact** or **less than significant**, or some could remain **potentially significant and unavoidable**.

18.5 References

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Figures

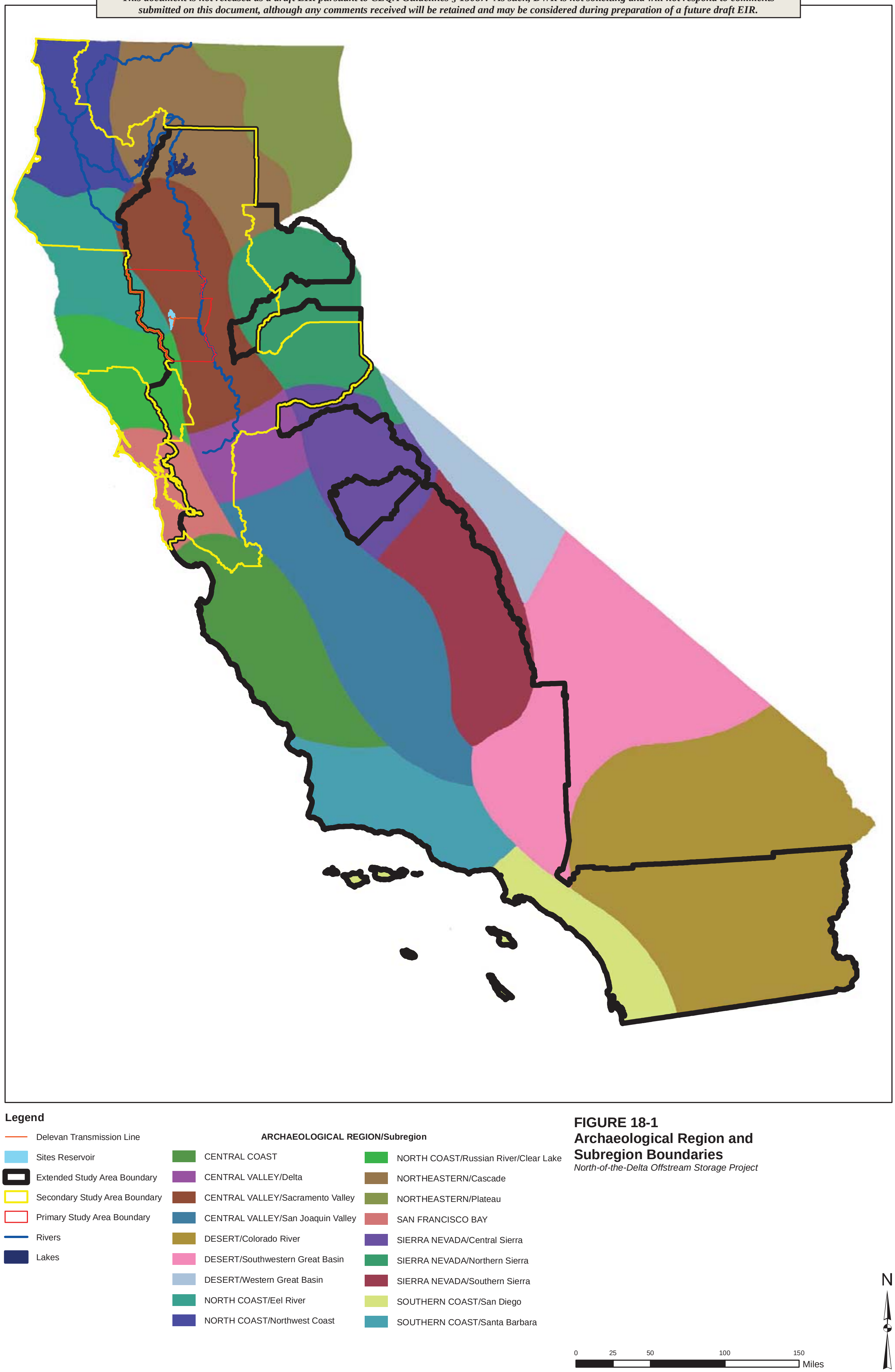

FIGURE 18-1
Archaeological Region and Subregion Boundaries
North-of-the-Delta Offstream Storage Project

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FIGURE 18-2
Native American Tribal Land Boundaries
North-of-the-Delta Offstream Storage Project

19. Indian Trust Assets

19.1 Introduction

This chapter discusses the Indian Trust Assets (ITAs) in the Extended, Secondary, and Primary study areas, and includes a discussion of the regulatory framework associated with ITAs. For this resource, the Extended Study Area is defined as the portions of the CVP and SWP service areas that could be affected by the North of the Delta Offstream Storage (NODOS) Project operations, located within 39 counties. The Secondary Study Area is defined as the CVP and SWP reservoirs, rivers, creeks, and associated floodplains that could be affected by Project operations, located in 22 counties.

The Primary Study Area (in Glenn and Colusa counties) is considered to be the footprint of the proposed Project facilities, the land immediately surrounding these facilities that could be affected by construction and/or maintenance activities (construction disturbance area), and the land parcels surrounding those areas that would be purchased (the Project Buffer). The NODOS Investigation focuses on offstream storage north of the Delta. Offstream storage located north of the Delta would require conveying water from the Sacramento River or one of its major tributaries to the new storage location. Offstream storage located north of the Delta would require conveying water from the Sacramento River or one of its major tributaries to the new storage location. An offstream storage conveyance system could either use existing diversions and canals and/or new diversions and conveyance. Water would be diverted during periods of relatively higher flow through the conveyance system, into the new offstream storage reservoir, and stored until it is needed to meet the planning objectives.

19.2 Regulatory Setting

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

The federal government, through treaty, statute or regulation, may take on specific, enforceable fiduciary obligations that give rise to a trust responsibility to federally recognized tribes and individual Indians possessing trust assets. Courts have recognized an enforceable federal fiduciary duty with respect to federal supervision of Indian money or natural resources, held in trust by the federal government, where specific treaties, statutes or regulations create such a fiduciary duty.

Consistent with President William J. Clinton’s 1994 memorandum, “Government-to-Government Relations with Native American Tribal Governments,” the U.S. Bureau of Reclamation (Reclamation) assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level when its actions affect ITAS (Federal Register, 1994. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 (1995) ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices. DOI is required to “protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (DOI Office of the Secretary, 2000). It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible. Reclamation complies with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs. Reclamation carries out its activities in a manner that protects trust assets and avoids adverse impacts when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation. Reclamation is responsible for assessing whether the NODOS Investigation for surface storage to support restoration of ecological health and improvement of water management for beneficial uses in the Bay-Delta system has the potential to affect ITAs. Reclamation will comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs.

There are no potential impacts to ITAs in the vicinity of the Extended, Secondary, and Primary study areas.

19.3 Environmental Consequences

This section addresses the concern of whether any ITA, including Public Domain Allotments (PDAs), would be adversely affected or beneficially affected by any of the alternatives being considered. Types of actions that could affect ITAs and PDAs include interference with the exercise of a reserved water right, degradation of water quality where a water right exists, impacts to fish and wildlife where hunting and fishing rights exist, or noise near a land asset where it adversely impacts use of the reserved land.

19.3.1 Key Impact and Evaluation Criteria

To address environmental consequences related to ITAs, the following issues have been evaluated to determine potential impacts and their level of significance:

- Are ITAs present in or adjacent to the water development area?
- If an ITA was present, would any of the alternatives being considered impede, change, or potentially benefit current activities within the ITA?

19.3.2 Impact Assessment Assumptions and Methodology

19.3.2.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to ITAs:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant (RBPP).
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and RBPP).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.

- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.

19.3.2.2 Methodology

Reclamation maintains GIS coverage of Indian reservations and rancherias for the State of California. The impact assessment for ITAs was based on this GIS coverage and maps of ITAs for the three study areas.

19.3.3 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

19.3.4 Environmental Impacts

None of the water development areas, i.e., the Extended, Secondary or the Primary Study Area contain ITAs.

19.3.4.1 Impacts Associated with the No Project/No Action Alternative

Implementation of the No Action/No Project Alternative would entail no change from Existing Conditions.

Extended Study Area – No Project/No Action Alternative

There would be **no potential impacts** in the Extended Study Area because there are no ITAs within the vicinity of the Extended Study Area.

Secondary Study Area – No Project/No Action Alternative

There would be **no potential impacts** in the Secondary Study Area because there are no ITAs within the vicinity of the Secondary Study Area.

Primary Study Area – No Project/No Action Alternative

There would be **no potential impacts** to the Primary Study Area because there are no ITAs within the vicinity of the Primary Study Area.

19.3.4.2 Impacts Associated with Alternatives A, B and C

Alternative A: 1.27-MAF Sites Reservoir with Delevan Pipeline, Alternative B: 1.81-MAF Sites Reservoir with Release-only Delevan Pipeline, and Alternative C: 1.81-MAF Sites Reservoir with Delevan Pipeline

There would be **no potential impacts** associated with any of the three alternatives because there are no ITAs within the vicinity of the Extended, Secondary, or Primary study areas.

19.4 Mitigation Measures

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

19.5 References

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20. Land Use

20.1 Introduction

This chapter describes the existing land uses for the Extended, Secondary, and Primary study areas. It also describes the planned land uses (according to the Tehama, Glenn, and Colusa County general plans) because Project facilities are proposed to be constructed in those counties. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for land use is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

20.2 Environmental Setting/Affected Environment

20.2.1 Extended Study Area

20.2.1.1 Methodology

Existing available documents were reviewed to characterize the existing land uses in the Extended Study Area.

20.2.1.2 Central Valley Project and State Water Project Service Areas

The Extended Study Area consists of the Central Valley Project (CVP) and the State Water Project (SWP) service areas located in northern and southern California. Land use in these areas varies considerably, depending on location, and includes agricultural, residential, commercial, industrial, and open space (which includes the wildlife refuges).

The CVP, operated by Reclamation, stores and delivers water within 29 of the State’s 58 counties, through the following facilities (considered industrial land uses): 21 reservoirs; 11 powerplants; 500 miles of major canals; and conduits, tunnels, and associated facilities (Reclamation, 2011). In the Central Valley, most municipal and industrial (M&I) service contract water use occurs near the cities of Redding and Sacramento and in some towns and cities in the San Joaquin Valley to meet the demand from those residential, commercial, and industrial land uses. Outside of the population centers of the San Francisco Bay Area and Sacramento and Stockton metropolitan areas, most of the CVP service area is rural, with irrigated agriculture representing the predominant land use (Reclamation, 2011).

SWP is a water storage and delivery system that is operated and maintained by DWR. The SWP stores and delivers water through the following facilities (considered industrial land uses): 34 storage facilities, reservoirs, and lakes; 20 pumping plants; four pumping-generating plants; five hydroelectric power plants; and approximately 701 miles of open canals and pipelines (DWR, 2013a). The SWP service area comprises almost 25 percent of California’s land area and more than 66 percent of its population. SWP water is used primarily for agricultural purposes (750,000 acres of irrigated farmland - mainly southern San Joaquin

Valley); the remaining water is used primarily on lands developed for residential, commercial, and industrial purposes.

20.2.1.3 San Luis Reservoir

San Luis Reservoir is located 12 miles west of the City of Los Banos in Merced County. It is a part of the San Luis Joint-Use Complex, which serves both the CVP and SWP (DWR, 2013b). The reservoir is located on all or portions of 28 parcels of land. Recreation and undeveloped open space comprise the land uses of the lands that surround the reservoir.

20.2.2 Secondary Study Area

20.2.2.1 Methodology

To characterize the land uses within the Secondary Study Area, a review of maps and aerial photography, existing available documents and websites of applicable agencies was conducted. Tehama County was contacted to obtain assessor's parcel number and Williamson Act contract information. General Plan land use designations were obtained by reviewing the County General Plan Land Use Map. The County designated land use describes the general type of land use that is allowed in a given area.

In addition, the California Department of Conservation, Office of Land Conservation's Farmland Mapping and Monitoring Program (FMMP) data were obtained and reviewed for the Red Bluff Pumping Plant site. The 2008 FMMP data set was used because this data was closest in date to the June 2009 baseline date. The FMMP Program inventories farmlands and classifies them according to their suitability for agricultural production as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built-up Land, Other Land, or Water. These classifications are described below:

- **Prime Farmland:** Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- **Farmland of Statewide Importance:** Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- **Unique Farmland:** Farmland of lesser quality soils used for the production of the State's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.
- **Farmland of Local Importance:** Land of importance to the local agricultural economy, as determined by each county's board of supervisors and a local advisory committee. The county-specific Board of Supervisors has the authority to adopt or recommend changes to this category of farmland.
- **Grazing Land:** Land on which the existing vegetation is suited to the grazing of livestock. This category was developed in Cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.

- **Urban/Built-Up Land:** Land occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.
- **Other Land:** Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and waterbodies smaller than forty acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.
- **Water:** Perennial water bodies with an extent of at least 40 acres.

20.2.2.2 Counties within the Secondary Study Area

Land use within the 22 counties of the Secondary Study Area varies greatly because of differences in population, economy, and environment; land uses include agricultural, residential, commercial, industrial, recreational, and undeveloped open space.

Urban development (i.e., residential, commercial, and industrial land uses) is concentrated around the State capitol of Sacramento, as well as in Sacramento County and in the counties of Solano, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, Marin, and Sonoma, as well as in the Sacramento-San Joaquin Delta. Commercial and industrial land uses within Shasta, Tehama, Colusa, and Glenn counties are concentrated along transportation corridors. Land use in Del Norte, Humboldt, and Trinity counties is greatly influenced by the amount of public and Native American tribal lands, much of which is used for timber production and other natural resource-related uses (USFWS, et al., 1999).

The counties within the Secondary Study Area also have lands that are dedicated to operation of the CVP and SWP waterbodies, with recreation and open space land uses being the primary land uses surrounding the waterbodies.

Land uses surrounding Trinity Lake and Whiskeytown Lake are primarily open space with some recreation. Open space land use surrounds Lewiston Lake and Keswick Reservoir and is along the Klamath River downstream of the Trinity River, Spring Creek, and Clear Creek. Land uses along the Trinity River consist primarily of open space with some rural residential and recreation. Land uses surrounding Shasta Lake include open space, recreation, residential, commercial, and industrial.

Land uses along the Sacramento River consist primarily of agriculture from Shasta County to Sacramento, with some recreation and open space. Several wildlife refuges also exist along the Sacramento River corridor. The Tehama-Colusa (T-C) Canal is located downstream of the Red Bluff Pumping Plant (RBPP) on the west bank of the Sacramento River in Tehama County. The T-C Canal is owned by Reclamation and is operated by the Tehama-Colusa Canal Authority (TCCA). TCCA delivers water to agricultural land uses to approximately 150,000 acres of land within Tehama, Glenn, Colusa, and Yolo counties (TCCA, 2013). The T-C Canal facilities are an industrial land use.

The Glenn-Colusa Irrigation District (GCID) Canal is located approximately 80 miles north of the City of Sacramento in Tehama, Glenn, and Colusa counties. The GCID Canal is owned and operated by GCID, providing water to agricultural land uses within its district boundaries that include 175,000 acres in the Sacramento Valley (GCID, 2013). The GCID Canal facilities are an industrial land use.

The Feather River supplies water to the SWP via Lake Oroville, near the city of Oroville in Butte County. Land uses along the Feather River and at/near Lake Oroville include agricultural, residential, commercial, industrial, recreational, and open space. The Thermalito Complex (the Thermalito Diversion Dam, Diversion Dam Powerplant, Power Canal, Forebay, Pumping/Generating Plant, and Afterbay) is located downstream from Oroville Dam. The land use adjacent to these facilities is open space.

Land uses at and near the Sutter Bypass and Yolo Bypass channels include agriculture, open space, and wildlife refuges, including the Sutter National Wildlife Refuge and the Yolo Bypass Wildlife Area.

The American River supplies water to the CVP via Folsom Lake in Placer, El Dorado and Sacramento counties. Land uses along the American River and at/near Folsom Lake include residential, commercial, industrial, recreational, and open space. Lake Natoma (a regulating reservoir for releases from Folsom Lake) is located downstream of Folsom Lake. Land uses near Lake Natoma include primarily open space and recreation, with some residential and office uses.

The Sacramento-San Joaquin Delta (Delta) is located at the confluence of the Sacramento and San Joaquin rivers and consists of channels and sloughs that flow into Suisun Bay, San Pablo Bay, and then San Francisco Bay before entering the Pacific Ocean. The Delta and bays are undergoing rapid urbanization associated with substantial population growth in the Bay Area and Central Valley regions. Other land uses in these areas include agricultural, rural residential, open space, and recreational.

20.2.2.3 Red Bluff Pumping Plant

The RBPP, located on the Sacramento River approximately two miles southeast of the City of Red Bluff in unincorporated Tehama County, is owned and operated by Reclamation. It is located on one parcel of land that is designated General Industrial[1] in the Tehama County General Plan (Tehama County, 2013). The RBPP site is an industrial land use that is located on FMMP-designated Urban/Built-Up land.

20.2.3 Primary Study Area

20.2.3.1 Methodology

Data, including a list of the assessor's parcels required for each Project facility (including the Project Buffer), the required acreage of each Assessor's Parcel Number; the County zoning designations of the parcels; the FMMP land use designations of the parcels, and the Project facilities that would be located on parcels that have a Williamson Act contract and/or a Wetlands Reserve Program (WRP) easement (pursuant to the Natural Resources Conservation Service) were reviewed. Provided below is a summary of that data by Project facility grouping. The information provided below is for the Project facility groupings plus the areas around the facility groupings that would be needed for Project construction activities, except for the Project Buffer. The Project Buffer would not have a construction disturbance area, but is included in this discussion to characterize the Existing Setting in that area.

20.2.3.2 Glenn and Colusa Counties

The Primary Study Area is located within Colusa and Glenn counties. These two counties are primarily rural with low populations, when compared to the remainder of California. There are a few small

[1] The intent of the General Industrial land use classification is to provide for industrial land uses, including light and heavy manufacturing, industrial parks, support wholesale energy production, related office uses, and industrial uses of similar character. This designation allows for non-industrial firms that provide materials and services related to industrial uses. Additional non-industrial uses may be permitted on an interim basis with conditions that provide for reversion to industrial uses.

incorporated cities and several unincorporated areas in these counties. Surrounding the developed communities are farms, ranches, and orchards (i.e., rural residential and agricultural land uses).

Glenn County

Glenn County is located in the western portion of the Sacramento Valley, north of Colusa County. Glenn County is approximately 849,000 acres in size, with approximately 68 percent in agriculture, 31 percent considered "other land[2]", and less than 1 percent in urban (i.e., residential, commercial, and/or industrial) land uses in 2010 (DOC, 2013).

In 2010, Glenn County had 348,147 acres of Important Farmlands (including Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance) and an additional 226,837 acres of grazing land. Between 2008 and 2010, Important Farmlands decreased by 11 acres and grazing land decreased by 554 acres in Glenn County (DOC, 2013).

Colusa County

Colusa County is located in the western portion of the Sacramento Valley. The county is approximately 740,000 acres in size, with approximately 76 percent in agriculture, 23 percent considered "other land", and less than 1 percent in urban (i.e., residential commercial, and/or industrial land uses in 2010 (DOC, 2013).

In 2010, Colusa County had 554,695 acres of Important Farmlands (including Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance), and an additional 9,161 acres of grazing land. Between 2008 and 2010, Important Farmlands decreased by 1,023 acres and grazing land increased by 50 acres in Colusa County (DOC, 2013).

20.2.3.3 Primary Study Area Project Facility Locations

Data, including a list of the assessor's parcels required for each Project facility (including the Project Buffer), the required acreage of each Assessor's Parcel Number (APN); the County zoning designations of the APNs; the FMMP land use designations of the APNs, and the Project facilities that would be located on APNs that have a Williamson Act contract and/or a WRP easement were reviewed. Provided below is a summary of that data by Project facility grouping. The information provided below is for the Project facility groupings plus the areas around the facility groupings that would be needed for Project construction activities, except for the Project Buffer. The Project Buffer would not have a construction disturbance area, but is included in this discussion to characterize the Existing Setting in that area.

Sites Reservoir Inundation Area and Sites Reservoir Dams

The proposed Sites Reservoir (either the Alternative A 1.27-MAF Reservoir or the Alternatives B and C 1.81-MAF Reservoir), the sites of the dams that would be required for the three alternatives (nine dams for Alternative A and 11 dams for Alternatives B and C), and seven borrow areas for the Project would be located within Antelope Valley in unincorporated Glenn and Colusa counties. Construction activities for these facilities would occur within a 1,000-acre area located to the east of Sites Reservoir.

The Sites Reservoir Inundation Area for all three alternatives would inundate the town of Sites in unincorporated Colusa County. The town of Sites was established in the late 1800s; it is currently a rural

[2] Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry, or aquaculture facilities; strip mines or borrow pits; and waterbodies smaller than 40 acres. Includes vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres.

and sparsely populated area, with an estimated population of 17 to 20 people (Colusa County, 2013). Sites are considered a Populated Place[3] by the U.S. Geological Survey (USGS GNIS, 2012).

Assessor's Parcels

The 1.27-MAF Sites Reservoir, associated dams (Alternative A), the borrow areas, plus the construction disturbance area to be located outside of Sites Reservoir would be located on all or portions of nine parcels of land in Glenn County, on all or portions of 128 parcels of land in Colusa County, and on all or portions of up to 12 additional parcels for which locations have not been determined.

The 1.81-MAF Sites Reservoir, associated dams (Alternatives B and C), the borrow areas, plus the construction disturbance area to be located outside of Sites Reservoir would be located on all or portions of eleven parcels of land in Glenn County, on all or portions of 136 parcels of land in Colusa County, and on all or portions of up to 12 additional parcels for which locations have not been determined.

Wetland Reserve Program Status

The proposed Sites Reservoir (both reservoir sizes), the dams required for the reservoir, the borrow areas, and the construction disturbance area to be located outside of Sites Reservoir would not be located on parcels of land that have WRP easements.

County Zoning Designations

Sites Reservoir and dams (Alternatives A, B, and C), the borrow areas, and the construction disturbance area to be located outside of Sites Reservoir would be located on lands that are zoned as Agricultural Preserve[4] (144-acre minimum) and Foothill Agricultural/Forestry[5] (144-acre minimum) in Glenn County, and Agriculture Preserve[6], Exclusive Agriculture[7], and Foothill Agricultural/Forestry (144-acre minimum) in Colusa County.

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[3] A Populated Place is defined as a place or area with clustered or scattered buildings and a permanent human population (city, settlement, town, or village). A Populated Place is usually not incorporated and be definition has no legal boundaries. However, a Populated Place may have a corresponding "civil" record, the legal boundaries of which may or may not coincide with the perceived populated place.

[4] The Agricultural Preserve Zone is to be applied to lands which are covered by a California Land Conservation Act (Williamson Act) contract with the county for the following purposes:

- To preserve the maximum amount of the limited supply of agricultural land which is necessary in the conservation of the county's economic resources and vital for a healthy agricultural economy of the county
- To protect the general welfare of the agricultural community for encroachments of unrelated agricultural uses which, by their nature, would be injurious to the physical and economic well-being of the agricultural community

[5] The Foothill Agricultural/Forestry Zone classification is established for the following purposes:

- To provide areas for extensive agricultural activities
- To protect the timber and forest lands economically suitable for logging

[6] The Agriculture Preserve Zone is intended to be applied in areas where agriculture is the natural and desirable primary land use and where the protection of agriculture from the encroachment of incompatible uses is essential to the general welfare.

[7] The Exclusive Agriculture Zone is intended to be applied in agricultural lands with a General Plan land use designation of Agriculture-General. This Zone is to be applied to those areas where agricultural activities are the appropriate and desirable primary land use. This Zone is to be applied to those areas where the protection of agriculture from the encroachment of incompatible uses is essential to the general welfare of the county citizens. It is to help maintain, protect, enhance, and propagate the county's agricultural resources. It is to protect and maintain a viable agricultural economy in the county, and to protect agriculturalists from environmental impacts and pressures as they relate to groundwater, nonagriculture traffic, and encroachment from residential development resulting in common agriculture/residential conflicts related to noise, odors, spraying, vandalism, trespassing, and predation from wildlife habitating on nonmaintained adjacent ten-acre sized lots.

Farmland Mapping and Monitoring Program Designations

Sites Reservoir and dams (Alternatives A, B, and C), the borrow areas, and the construction disturbance area to be located outside of Sites Reservoir would be located on lands designated as Grazing Land, Local Potential Farmland, and Other Land in Glenn County, and on lands designated as Farmland of Local Importance and Other Land in Colusa County.

Williamson Act Contract Status

Sites Reservoir and dams (Alternative A), the borrow areas, and the construction disturbance area to be located outside of Sites Reservoir would be located on up to 86 parcels of land that have Williamson Act contracts. Of that total, eight contracts are with Glenn County, 66 contracts are with Colusa County, and up to 12 additional Williamson Act contracts are included for parcels for which locations have not been determined. Glenn County contracts renew on March 1 each year. Colusa County contracts renew on January 1 each year.

Sites Reservoir and dams (Alternatives B and C), the borrow areas, and the construction disturbance area to be located outside of Sites Reservoir would be located on up to 95 parcels of land that have Williamson Act contracts. Of that total, nine contracts are with Glenn County, 74 contracts are with Colusa County, and up to 12 additional Williamson Act contracts are included for parcels for which locations have not been determined.

Recreation Areas

Up to five locations were determined to be potentially feasible recreation areas at Sites Reservoir to provide recreation opportunities: Stone Corral Recreation Area (235 acres), Saddle Dam Recreation Area (329 acres), Peninsula Hills Recreation Area (373 acres), Antelope Island Recreation Area (49 acres), and Lurline Headwaters Recreation Area (219 acres) totaling 1,205 acres. All construction activities for the Recreation Areas would occur within the footprints of the individual recreation areas.

Assessor's Parcels

The Recreation Areas would be located on all or portions of four parcels of land in Glenn County and 11 parcels of land in Colusa County.

Wetland Reserve Program Status

The Recreation Areas would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Recreation Areas would be located on lands that are zoned as Agricultural Preserve (144-acre minimum) in Glenn County, and Agriculture Preserve in Colusa County.

Farmland Mapping and Monitoring Program Designations

The Recreation Areas would be located on lands that are designated as Grazing Land and Local Potential Farmland in Glenn County and Farmland of Local Importance and Other Land in Colusa County.

Williamson Act Contract Status

The Recreation Areas would be located on 14 parcels of land that have Williamson Act contracts. Of that total, four contracts are with Glenn County, and 10 contracts are with Colusa County. Glenn County contracts renew on March 1 each year. Colusa County contracts renew on January 1 each year.

Road Relocations, South Bridge, and Terminal Regulating Reservoir Pipeline Road

Sites Reservoir would inundate several existing roads within Colusa County's jurisdiction; so as part of the Project (all alternatives), several roads would be rerouted to provide alternate access routes. In addition, new roads would be required to access various Project facilities. The "Road Relocations" discussed below include both the re-routed existing roads and the proposed Project roads. The South Bridge would be located within the footprint of the Sites Reservoir Inundation Area; therefore, the acreage in this discussion is limited to only the roads.

Assessor's Parcels

The Alternative A Road Relocations would be located on all or portions of 12 parcels of land in Glenn County and on all or portions of 45 parcels of land in Colusa County.

The Alternative B and C Road Relocations would be located on all or portions of 11 parcels of land in Glenn County and on all or portions of 42 parcels of land in Colusa County.

Wetland Reserve Program Status

The Road Relocations (all three alternatives) would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Alternative A, B and C Road Relocations would be located on lands that are zoned as Agricultural Preserve (144-acre minimum) and Agricultural Preserve (72-acre minimum) in Glenn County, and Agriculture Preserve in Colusa County.

Farmland Mapping and Monitoring Program Designations

The Alternatives A, B and C Road Relocations would be located on lands that are designated as Farmland of Local Importance, Local Potential Farmland, Other Land, and Grazing Land.

Williamson Act Contract Status

The Alternative A Road Relocations would be located on 52 parcels of land that have Williamson Act contracts. Of that total, 11 contracts are with Glenn County, and 41 contracts are with Colusa County. Glenn County contracts renew on March 1 each year. Colusa County contracts renew on January 1 each year.

The Alternative B and C Road Relocations would be located on 48 parcels of land that have Williamson Act contracts. Of that total, 10 contracts are with Glenn County, and 38 contracts are with Colusa County.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and the Asphalt Batch Plant would be located to the west of the existing Funks Reservoir between it and the proposed Sites Reservoir on primarily open space lands.

Assessor's Parcels

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Asphalt Batch Plant, and associated construction disturbance area would be located on all or portions of seven parcels of land in Colusa County.

Wetland Reserve Program Status

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Asphalt Batch Plant, and associated construction disturbance area would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Asphalt Batch Plant, and associated construction disturbance area would be located on lands that are zoned as Agriculture Preserve in Colusa County.

Farmland Mapping and Monitoring Program Designations

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Asphalt Batch Plant, and associated construction disturbance area would be located on lands that are designated as Farmland of Local Importance.

Williamson Act Contract Status

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Asphalt Batch Plant, and associated construction disturbance area would be located on six parcels of land that have Williamson Act contracts with Colusa County. Colusa County contracts renew on January 1 each year.

Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard

The Holthouse Reservoir Complex (which includes Holthouse Reservoir and Dam, breached Funks Dam, the dredging of Funks Reservoir, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, the Funks Bypass Pipeline, and the Holthouse to T-C Canal Pipeline), the Holthouse Reservoir Electrical Switchyard, and the Delevan Pipeline Electrical Switchyard would be located on agricultural and open space lands, with the exception of Funks Reservoir and Funks Dam, which are existing facilities.

Assessor's Parcels

The Holthouse Reservoir Complex, the Holthouse Reservoir Electrical Switchyard, the Delevan Pipeline Electrical Switchyard, and associated construction disturbance area around these facilities would be located on all or portions of 14 parcels of land in Colusa County, as well as on up to 10 other parcels that are included within the Delevan Pipeline/TRR Pipeline construction disturbance area.

Wetland Reserve Program Status

The Holthouse Reservoir Complex, the Holthouse Reservoir Electrical Switchyard, the Delevan Pipeline Electrical Switchyard, and associated construction disturbance area around these facilities would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Holthouse Reservoir Complex, the Holthouse Reservoir Electrical Switchyard, the Delevan Pipeline Electrical Switchyard, and associated construction disturbance area around these facilities would be located on lands that are zoned as Agriculture Preserve and Exclusive Agriculture in Colusa County.

Farmland Mapping and Monitoring Program Designations

The Holthouse Reservoir Complex, the Holthouse Reservoir Electrical Switchyard, the Delevan Pipeline Electrical Switchyard, and associated construction disturbance area around these facilities would be located on lands that are designated as Prime Farmland and Farmland of Local Importance.

Williamson Act Contract Status

The Holthouse Reservoir Complex, the Holthouse Reservoir Electrical Switchyard, the Delevan Pipeline Electrical Switchyard, and associated construction disturbance area around these facilities would be located on three parcels of land that have a Williamson Act contract with Colusa County, as well as on one other parcel that is included within the Delevan Pipeline/TRR Pipeline construction disturbance area. Colusa County contracts renew on January 1 each year.

Glenn-Colusa Irrigation District Canal Facilities Modifications

The GCID Canal is an existing irrigation canal that delivers water from the Sacramento River to irrigation districts along its route from its diversion point northwest of Hamilton City in Glenn County to southeast of Williams, in Colusa County. The proposed Project improvements include a new headgate structure, canal lining, and a railroad siphon replacement.

Assessor's Parcels

The modifications to the GCID Canal headgate structure and canal lining would be located on all or portions of one parcel of land in Glenn County.

The modifications to the GCID Canal railroad siphon would be located on all or portions of two parcels of land in Glenn County.

Wetland Reserve Program Status

The modifications to the GCID Canal headgate structure, canal lining, and railroad siphon would be located on no parcels of land that have WRP easements.

County Zoning Designations

The modifications to the GCID Canal headgate structure and canal lining would be located on lands that are identified as Canal on the Glenn County Zoning Map. The railroad siphon modifications would be located on the Canal, which does not have a zoning classification on the Zoning Map (Glenn County, 2006). The County's land use and zoning website (Glenn County, 2013) indicates that the lands encompassing the GCID Canal headgate structure, canal lining, and railroad siphon are zoned NL (meaning "no information available") and that the construction disturbance area for those facilities is zoned NL and Intensive Agriculture.

Farmland Mapping and Monitoring Program Designations

The modifications to the GCID Canal headgate structure and canal lining and associated construction disturbance area would be located on lands that are designated as primarily Other Land with a small amount of land designated as Farmland of Statewide Importance.

The modifications to the GCID Canal railroad siphon and associated construction disturbance area would be located on lands that are designated as primarily Urban/Built-Up Land, with a small amount of land designated as Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance.

Williamson Act Contract Status

The modifications to GCID Canal headgate structure, canal lining, and railroad siphon would be located on no parcels of land that have Williamson Act contracts.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir to Funks Creek Pipeline, Terminal Regulating Reservoir to Funks Creek Outlet, and Terminal Regulating Reservoir Electrical Switchyard

Water conveyed down the GCID Canal would be directed into the proposed TRR. The TRR and its associated facilities would be located on agricultural lands.

Assessor's Parcels

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, TRR Electrical Switchyard, and the construction disturbance area around these facilities would be located on all or portions of nine parcels of land in Colusa County.

Wetland Reserve Program Status

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, TRR Electrical Switchyard, and the construction disturbance area would be located on no parcels of land that have WRP easements.

County Zoning Designations

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, TRR Electrical Switchyard, and the construction disturbance area would be located on lands that are zoned as Exclusive Agriculture in Colusa County.

Farmland Mapping and Monitoring Program Designations

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, TRR Electrical Switchyard, and the construction disturbance area would be located on lands that are designated as Prime Farmland, Farmland of Local Importance, and Other Land.

Williamson Act Contract Status

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, TRR Electrical Switchyard, and the construction disturbance area would be located on no parcels of land that have Williamson Act contracts.

Delevan Pipeline and Terminal Regulating Reservoir Pipeline

The approximately 13.5-mile-long Delevan Pipeline would be routed from the Delevan Pipeline Intake/Discharge Facilities to Holthouse Reservoir for Alternatives A, B, and C. It would convey water from the Sacramento River to Holthouse Reservoir to fill Sites Reservoir, and also convey water from Holthouse Reservoir to release to the Sacramento River for Alternatives A and C. Although the Alternative B Delevan Pipeline would only convey water from Holthouse Reservoir to release to the Sacramento River, the Delevan Pipeline would have the same facility footprint for all three alternatives.

The 3.5-mile-long TRR Pipeline would convey water from the TRR to Holthouse Reservoir. The western 3.5-mile length of the Delevan Pipeline would parallel the TRR Pipeline.

Assessor's Parcels

The 10-mile-long eastern portion of the Delevan Pipeline, the TRR Pipeline, the 3.5-mile-long western portion of the Delevan Pipeline, and the construction disturbance area would be located on 64 parcels of land in Colusa County.

Wetland Reserve Program Status

The 10-mile-long eastern portion of the Delevan Pipeline and the construction disturbance area would be located on one parcel of land that has a WRP easement.

The 3.5-mile-long western portion of the Delevan Pipeline, the TRR Pipeline, and their construction disturbance area would not be located on parcels that have WRP easements.

County Zoning Designations

The 10-mile-long eastern portion of the Delevan Pipeline and the construction disturbance area would be located on lands designated as Exclusive Agriculture and Light or Heavy Industrial in Colusa County.

The 3.5-mile-long western portion of the Delevan Pipeline, the TRR Pipeline, and their construction disturbance area would be located on lands designated as Exclusive Agriculture in Colusa County.

Farmland Mapping and Monitoring Program Designation

The 10-mile-long eastern portion of the Delevan Pipeline and the construction disturbance area would be located on lands designated as Prime Farmland, Unique Farmland, and Other Land.

The 3.5-mile-long western portion of the Delevan Pipeline, the TRR Pipeline, and their construction disturbance area would be located on lands designated as Prime Farmland and Farmland of Local Importance.

Williamson Act Contract Status

The Delevan and TRR pipelines and their associated construction disturbance area would be located on 11 parcels of land that have Williamson contracts with Colusa County. Colusa County contracts renew on January 1 each year.

Delevan Transmission Line

A 230-kV Delevan Transmission Line would conduct electricity from an existing power source to provide all of the electricity needed by the Project's pumping plants.

The Delevan Transmission Line would differ between alternatives. In Alternatives A and C, it would parallel the Delevan Pipeline from the Delevan Pipeline Intake Facilities to the TRR. It would then be aligned from the TRR to the Sites Electrical Switchyard. The Alternative B Delevan Electrical Transmission Line would be aligned only from its connection with the existing PG&E 230-kV or WAPA 500-kV/230-kV transmission line to the Sites Pumping/Generating Plant. The transmission line towers (Alternatives A, B, and C) would be sited within a 150-foot-wide permanent transmission line easement.

Assessor's Parcels

The Alternatives A and C Delevan Transmission Line and associated construction disturbance area would be located on all or portions of 39 parcels of land in Colusa County.

The Alternative B Delevan Transmission Line and associated construction disturbance area would be located on all or portions of eight parcels of land in Colusa County.

Wetland Reserve Program Status

The Alternatives A and C Delevan Transmission Line and associated construction disturbance area would be located on one parcel of land that has a WRP easement.

The Alternative B Delevan Transmission Line and associated construction disturbance area would be located on no parcels of land that have a WRP easement.

County Zoning Designations

The Alternatives A and C Delevan Transmission Line and associated construction disturbance area would be located on lands designated as Agriculture Preserve and Exclusive Agriculture in Colusa County.

The Alternative B Delevan Transmission Line and associated construction disturbance area would be located on lands designated as Agriculture Preserve and Exclusive Agriculture in Colusa County.

Farmland Mapping and Monitoring Program Designation

The Alternatives A and C Delevan Transmission Line and associated construction disturbance area would be located on lands designated as Prime Farmland and Farmland of Local Importance.

The Alternative B Delevan Transmission Line and associated construction area would be located on lands designated as Farmland of Local Importance.

Williamson Act Contract Status

The Alternatives A and C Delevan Transmission Line and associated construction disturbance area would be located on 11 parcels of land that have Williamson Act contracts with Colusa County. Colusa County contracts renew on January 1 each year.

The Alternative B Delevan Transmission Line and associated construction disturbance area would be located on six parcels that have Williamson Act contracts with Colusa County.

Delevan Pipeline Intake Facilities

Alternatives A and C include a fish screen and pumping/generating facilities to divert water from the Sacramento River, and also includes a water release capability to the Sacramento River.

Assessor's Parcels

The Delevan Pipeline Intake Facilities and associated construction disturbance area would be located on all or portions of two parcels of land in Colusa County.

Wetland Reserve Program Status

The Delevan Pipeline Intake Facilities and associated construction disturbance area would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Delevan Pipeline Intake Facilities and associated construction disturbance area would be located on lands designated as Exclusive Agriculture and Floodway in Colusa County.

Farmland Mapping and Monitoring Program Designation

The Delevan Pipeline Intake Facilities and associated construction disturbance area would be located on lands designated as Prime Farmland and Other Land.

Williamson Act Contract Status

The Delevan Pipeline Intake Facilities and associated construction disturbance area would be located on no parcels of land that have Williamson Act contracts.

Delevan Pipeline Discharge Facility

Alternative B includes the release-only Delevan Pipeline Discharge Facility. This alternative would provide no Sacramento River water diversion capability.

Assessor's Parcels

The Delevan Pipeline Discharge Facility and associated construction disturbance area would be located on all or portions of three parcels of land in Colusa County.

Wetland Reserve Program Status

The Delevan Pipeline Discharge Facility and associated construction disturbance area would be located on no parcels of land that have WRP easements.

County Zoning Designations

The Delevan Pipeline Discharge Facility and associated construction disturbance area would be located on lands designated as Exclusive Agriculture and Floodway in Colusa County.

Farmland Mapping and Monitoring Program Designation

The Delevan Pipeline Discharge Facility and associated construction disturbance area would be located on lands designated as Prime Farmland and Other Land.

Williamson Act Contract Status

The Delevan Pipeline Discharge Facility and associated construction disturbance area would be located on no parcels of land that have Williamson Act contracts.

Electrical Distribution Lines

The Electrical Distribution Lines would supply electricity to Golden Gate Dam, Sites Dam, South Bridge, and the Lurline Headwaters, Peninsula Hills, and Stone Corral recreation areas.

Assessor's Parcels

The Alternative A Electrical Distribution Lines and associated construction disturbance area would be located on all or portions of 16 parcels of land in Colusa County.

The Alternatives B and C Electrical Distribution Lines and associated construction disturbance area would be located on all or portions of 14 parcels of land in Colusa County.

Wetland Reserve Program Status

The Electrical Distribution Lines (Alternatives A, B, and C) and associated construction disturbance area would not be located on parcels of land that have WRP easements.

County Zoning Designations

The Electrical Distribution Lines (Alternatives A, B, and C) and associated construction disturbance area would be located on lands designated as Agriculture Preserve in Colusa County.

Farmland Mapping and Monitoring Program Designation

The Electrical Distribution Lines (Alternatives A, B, and C) and associated construction disturbance area would be located on lands designated as Farmland of Local Importance and Other Land.

Williamson Act Contract Status

The Alternative A Electrical Distribution Lines and associated construction disturbance area would be located on 16 parcels of land that have Williamson Act contracts with Colusa County. Colusa County contracts renew on January 1 each year.

The Alternatives B and C Electrical Distribution Lines and associated construction disturbance area would be located on 14 parcels of land that have Williamson Act contracts with Colusa County.

Project Buffer

The Project Buffer would consist of the land surrounding Project facility footprints, extending out to the nearest parcel boundary, to create a buffer around most Project facilities. The Delevan and TRR pipelines, Delevan Transmission Line, and Road Relocations and South Bridge would not have an associated Project Buffer, but portions of these facilities would be located within the buffer of other facilities due to their proximity to or connection with other facilities. In addition, the GCID Canal Facilities Modifications would not have an associated Project Buffer. The outer perimeter boundary of the Project Buffer would be the same for the three alternatives. Due to the differences in Project facilities between the three alternatives, the size and shape of the Project Buffer would differ between alternatives.

Assessor's Parcels

The Alternative A Project Buffer would be located on all or portions of 10 parcels of land in Glenn County and on all or portions of 102 parcels of land in Colusa County.

The Alternatives B and C Project Buffer would be located on all or portions of 10 parcels of land in Glenn County and on all or portions of 98 parcels of land in Colusa County.

Wetland Reserve Program Status

The Project Buffer (for Alternatives A, B, and C) would not be located on parcels of land that have WRP easements.

County Zoning Designation

The Alternative A, B and C Project Buffer would be located on lands that are zoned as Agricultural Preserve (144-acre minimum) and Foothill Agricultural/Forestry (144-acre minimum) in Glenn County, and as Agriculture Preserve, Exclusive Agriculture, Foothill Agricultural/Forestry (144-acre minimum), and Floodway in Colusa County.

Farmland Mapping and Monitoring Program Designation

The Alternative A, B and C Project Buffer would be located on lands designated as Grazing, Prime Farmland, Farmland of Local Importance, Local Potential Farmland, Unique Farmland, Water, and Other Land.

Williamson Act Contract Status

The Alternative A Project Buffer would be located on 81 parcels of land that have Williamson Act contracts. Of that total, eight contracts are with Glenn County, and 73 contracts are with Colusa County. Glenn County contracts renew on March 1 each year. Colusa County contracts renew on January 1 each year.

The Alternatives B and C Project Buffer would be located on 77 parcels of land that have Williamson Act contracts. Of that total, eight contracts are with Glenn County, and 69 contracts are with Colusa County.

20.3 Environmental Impacts/Environmental Consequences

20.3.1 Regulatory Setting

Land uses are inventoried at the State and local agency levels, and are regulated at the federal, State, and local agency levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

20.3.1.1 Federal Plans, Policies, and Regulations

- U.S Department of Agriculture, Natural Resources Conservation Service – Farmland Protection Policy Act of 1981
- U.S. Department of Agriculture, Natural Resources Conservation Service – Wetlands Reserve Program

20.3.1.2 State Plans, Policies, and Regulations

- California Department of Conservation, Office of Land Conservation – Important Farmland Inventory System and Farmland Mapping and Monitoring Program
- California Land Conservation Act of 1965 (Williamson Act)
- California State Planning and Zoning Laws

20.3.1.3 Regional and Local Plans, Policies, and Regulations

- Tehama County General Plan (2009)
- Tehama County Code (No Date)
- Glenn County General Plan (1993)
- Glenn County Code (No Date)
- Colusa County General Plan (2012)
- Colusa County Code (1991)

Several federal, State, and local land use planning and zoning, as well as agricultural conservation regulations, are in effect that are relevant to the action alternatives. The regulations are listed above and described in Chapter 4 Environmental Compliance and Permit Summary. They are also discussed briefly below to provide context for the information that is provided for the Project facilities environmental setting, as well as the impacts analysis, because several of the impact evaluation criteria in this chapter pertain to these issues.

- **U.S. Department of Agriculture, Natural Resources Conservation Service - Farmland Protection Policy Act of 1981:** This Act is a federal regulation that is intended to minimize the impact of federal programs with respect to the conversion of farmland to nonagricultural uses. It ensures that, to the extent possible, federal programs are administered to be compatible with State, local, and private programs and policies to protect farmland.
- **U.S. Department of Agriculture, Natural Resources Conservation Service – Wetlands Reserve Program:** The Wetlands Reserve Program (WRP) is a voluntary program that offers landowners the opportunity to protect, restore, and enhance wetlands on their property. The Program has several enrollment options. In exchange for the landowner precluding development on the lands and restoring the lands, the USDA NRCS pays certain costs to the landowner and provides technical assistance to the landowner to restore, protect, and enhance wetlands on eligible lands. Approximately 779 acres of land

in Glenn County have WRP easements; approximately 8,894 acres of land in Colusa County have WRP easements (NRCS, 2013).

- **Important Farmland Inventory System and Farmland Mapping and Monitoring Program:** The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). Lands are classified according to their suitability for agricultural production as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built-up Land, Other Land, and Water.

- **California Land Conservation Act of 1965 (Williamson Act):** The Williamson Act enables local governments to enter into contracts with private landowners to promote the continued use of relevant land into agricultural or related open space use by establishing agricultural preserves. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. The Williamson Act was enhanced in 1998 with Farmland Security Zones (also known as Super Williamson Act lands).

- **California State Planning and Zoning Laws:** California Government Code Section 65300 et seq. establishes the obligation of cities and counties to adopt and implement General Plans. California Government Code Section 65800 et seq. establishes that zoning ordinances, which are laws that define allowable land uses in a specific district, are required to be consistent with the General Plan and any applicable Specific Plan. The individual General Plans and zoning ordinances that are applicable to the Project are listed in Section 20.3.1.3.

20.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for land use and planning and agriculture and forestry resources:

Would the Project:

- Physically divide an established community?

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use?

- Conflict with existing zoning for agricultural use, or a Williamson Act contract?

- Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?

- Result in the loss of forest land or conversion of forest land to non-forest use?

- Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Physical division of an established community.
- Conflict with an applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect.
- Changes in land use as a result of implementing the alternatives that are considered to be incompatible with the existing land uses at and adjacent to the proposed Project facilities.
- Permanent conversion of Prime Farmland, as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use. In contrast, temporary or non-permanent conversion (i.e., during Project construction) of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland would result in a less-than-significant impact. In addition, permanent conversion of Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland would result in a less-than-significant impact.
- Permanent conflict with existing zoning for agricultural use, and/or the permanent conversion of lands that have a Williamson Act contract. In contrast, temporary conflicts (i.e., during Project construction) with existing zoning for agricultural use, or the temporary conversion (i.e., during Project construction) of lands that have a Williamson Act contract would result in a less-than-significant impact if the lands are restored to agricultural land use and the temporary impact does not exceed three years.
- Permanent conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g)). In contrast, temporary conflicts (i.e., during Project construction) with existing zoning for forest land or timberland would result in a less-than-significant impact.
- The permanent loss of forest land or permanent conversion of forest land to non-forest use. In contrast, the temporary loss or conversion (i.e., during Project construction) of forest land or timberland would result in a less-than-significant impact.
- Other changes in the existing environment which, due to their location or nature, could result in the permanent conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to non-agricultural use or permanent conversion of forest land to non-forest use. In contrast, temporary conversion (i.e., during Project construction) of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland, or the temporary conversion of forest land to non-forest use would result in a less-than-significant impact.

20.3.3 Impact Assessment Assumptions and Methodology

20.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to land use:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the RBPP.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and RBPP).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation, increased reliability of water supply to agricultural, municipal, and industrial water users, and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- Temporary impacts to land use would occur during the Project construction period. Temporary impacts would occur within a "construction disturbance area". Because land use changes could occur anywhere within each Project facility footprint once Project construction starts, and to provide a worst-case scenario of land use impacts, the construction disturbance area for every Project facility (except for the Recreation Areas) was determined to consist of (1) the Project facility footprint, plus (2) an area outside of the Project facility footprint where Project construction activities could occur, in which the following activities could include, but are not limited to, facility construction/installation, facility assembly, materials laydown/storage, soil stockpiling, borrow areas, spoils disposal areas, and/or deliveries. Because some Project facilities would be located close to other Project facilities, some of the construction disturbance areas would be used for more than one Project facility. For the Recreation Areas, the construction disturbance area was determined to be the same as the permanent disturbance area.
- Permanent impacts to land use would occur at the facility footprint of every Project facility (i.e., the permanent disturbance area) and would last for the period of Project analysis (i.e., 100 years). Permanent impacts would begin when Project construction is complete. Permanent impacts would occur as a result of the presence of the Project facilities, from Project facility operations and

maintenance activities, and from the presence of the Project Buffer[8], which could preclude some existing land uses from occurring within that area.

- Defined construction disturbance areas were available for the Delevan and TRR pipelines, Delevan Transmission Line, Electrical Distribution Lines, and Roads Relocations. For all other Project facilities (in which the coordinate space was not defined for specific proposed Project facilities or construction disturbance areas for the facilities), the following assumptions were developed regarding size and potential location.
  - **Sites Reservoir Inundation Area and Sites Reservoir Dams and Borrow Areas:** In addition to the acreage for the footprints of the Sites Reservoir Inundation Area and Sites Reservoir Dams and Borrow Areas, a 1,000-acre construction disturbance area would be located to the east of Sites Reservoir. The precise location has not been defined; however, the parcels of land that are being considered for this area encompass the Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard facility footprints, as well as several proposed Project roads and other parcels located near those facilities. There are seven borrow areas defined within the Sites Reservoir Inundation Area, and they are accounted for within the inundation area calculations.
  - **Recreation Areas:** The construction disturbance area would be the same as the permanent disturbance area (i.e., it is the footprint of each Recreation Area). All Project facilities that would be located within the Recreation Areas (e.g., roads and distribution lines) are accounted for within the Recreation Areas facility grouping.
  - **Road Relocations, South Bridge, and TRR Pipeline Road:** The defined construction disturbance area along all Project roads would be 200 feet wide (100 feet on both sides of the roadways' centerline – except for the TRR Pipeline Road discussed below – its construction disturbance area would be less); the permanent disturbance area along the roads' alignments would average approximately 60 feet wide. Portions of the proposed roads would be located within the 1,000-acre construction disturbance area associated with Sites Reservoir Inundation Area and Sites Reservoir Dams (and the other facilities listed above that are included within the 1,000 acres). Because it is uncertain which land parcels would comprise the 1,000 acres, it was determined that the footprints of the proposed roads in those parcels should be accounted for with the roads and not as part of the Sites Reservoir and Dams category listed above. The 20-foot-wide gravel inspection road from the TRR to Holthouse Reservoir and Dam (known as the TRR Pipeline Road) would generate permanent ground disturbance, and it is accounted for in these calculations.
  - **Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard:** The construction disturbance area for these facilities would be approximately 99 acres (90 acres of facility footprints plus an assumed 10 percent extra [i.e., 9 acres] for construction activities). This 99 acres would be located within

[8] The Project Buffer lands would remain undeveloped; the existing vegetation would be maintained as wildlife habitat and protected from fuelwood harvest, grazing, and other forms of environmental degradation. Existing structures within the Project Buffer would be demolished and the remaining land would be managed as wildlife habitat. Existing agricultural lands would not be maintained as agriculture; they would be converted and managed as wildlife habitat.

the 1,000 acres mentioned above for the Sites Reservoir Inundation Area and Sites Reservoir Dams, and are accounted for in those calculations.

– **Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard:** The construction disturbance area for these facilities would be approximately 383 acres (348 acres of facility footprints plus an assumed 10 percent extra [i.e., 35 acres] for construction activities). The 383 acres would be located within the construction disturbance area for the Delevan and TRR pipelines, and are accounted for in those calculations. The Delevan Pipeline Electrical Switchyard would generate permanent ground disturbance and is accounted for in these calculations. The total facility footprints for this grouping would be 572 acres, including 224 acres of water surface associated with the existing Funks reservoir and additional facility footprints of 348 acres for the Project facility grouping.

– **Glenn-Colusa Irrigation District Canal Facilities Modifications:** The construction disturbance area for these facility modifications would be approximately 0.77 acre (0.7 acre for the canal lining and headgate structure plus an assumed 10 percent extra [i.e., 0.07 acre] for construction activities) plus approximately 0.22 acre (0.2 acre for the railroad siphon plus an assumed 10 percent extra [i.e., 0.02 acre] for construction activities). The total 0.99 acre would be located within the existing GCID Canal and the existing railroad siphon area.

– **Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir:** The construction disturbance area for these facilities would be approximately 214 acres (195 acres of facility footprints plus an assumed 10 percent extra [i.e., 19 acres] for construction activities). The 214 acres would be located within the construction disturbance area for the Delevan and TRR pipelines, and are accounted for in those calculations.

– **Delevan Pipeline and Terminal Regulating Reservoir Pipeline:** The construction disturbance area for these underground pipelines would be 1,500 feet wide and 13 miles long. The construction disturbance area attributed to the pipelines is approximately 2,058 acres for Alternatives A and C, and 2,265 acres for Alternative B, excluding acreage that is already accounted for under other Project facility groupings. There would be permanent disturbance associated with the two pipelines from regularly spaced aboveground facilities, such as blow-off structures, air valve structures, and an outlet and energy dissipater structure. The precise locations of these structures are not currently known, so their permanent disturbance is not accounted for in this land use analysis.

– **Delevan Transmission Line:** The construction disturbance area for the Delevan Transmission Line would be 150 feet wide and would be located within the 1,500-foot-wide construction disturbance area for the Delevan and TRR pipelines for nine miles of their approximate 13-mile length. The remaining four-mile-long portion of the Delevan Transmission Line that would not overlap with the Delevan and TRR pipeline construction disturbance area would result in approximately 71 acres of construction disturbance area. The permanent disturbance associated with the Delevan Transmission Line was calculated to be approximately 2.5 acres for Alternatives A and C and 0.5 acre for Alternative B, and was based on an assumed number of towers and an assumed disturbance needed for the footings of each tower (70 towers for Alternatives A and C and 15 towers for Alternative B). Because the precise locations of the towers is not known, it was assumed that land use impacts from the tower footings could occur anywhere along the 13-mile-long transmission line alignment. That assumption meant that the precise parcel of land, and its associated zoning, FMMP land use designation, and Williamson Act contract status could not be determined, resulting in presenting “potentially affected parcels” in the land use analysis, which would result in an overstatement regarding the number of parcels that would be affected, and a worst-case presentation of compatibility with existing zoning, FMMP land use designations, and Williamson Act contracts.

– **Electrical Distribution Lines:** Distribution lines to supply electricity to three of the Recreation Areas would be located within the Lurline Headwaters, Peninsula Hills, and Stone Corral recreation areas and have been accounted for within the Recreation Areas facility grouping. Other distribution lines that would be needed for the Project (e.g., for Golden Gate Dam, Sites Dam, and South Bridge) and connections to the Recreation Areas (but located outside of the Recreation Areas) are included in this Electrical Distribution Lines facility grouping.

– **Delevan Pipeline Intake Facilities (Alternatives A and C):** The permanent disturbance area (i.e., facility footprint) would be approximately 19.1 acres. The construction disturbance area for this facility would be smaller than the facility footprint (it would be approximately 17.1 acres) because approximately two acres of the facility footprint overlaps with the Delevan Pipeline construction disturbance area, and the two acres are accounted for in those calculations. In addition, the portion of the Delevan Pipeline construction disturbance area that is near to the Delevan Pipeline Intake Facilities is assumed to also be used for Delevan Pipeline Intake Facilities construction activities.

– **Delevan Pipeline Discharge Facility (Alternative B):** The permanent disturbance area (i.e., facility footprint) would be approximately 7.7 acres. The construction disturbance area for this facility would be smaller than the facility footprint (it would be approximately 6.3 acres) because approximately 1.4 acres of the facility footprint overlaps with the Delevan Pipeline construction disturbance area, and the 1.4 acres are accounted for in those calculations. In addition, the portion of the Delevan Pipeline construction disturbance area that is near to the Delevan Pipeline Discharge Facility is assumed to also be used for Delevan Pipeline Discharge Facility construction activities.

– **Project Buffer:** The Project Buffer would consist of the land that would be acquired for the Project beyond the facility footprints, out to the nearest existing parcel boundaries. The Project Buffer would surround Sites Reservoir, the Holthouse Reservoir Complex, and all facilities located between these two facilities; the Terminal Regulating Reservoir and associated facilities; and the Delevan Pipeline Intake/Discharge facilities[9]. Because the Project Buffer boundary would follow existing parcel boundaries, the width of the buffer around Project facilities would vary. The acreage for the temporary land use impacts of the Project Buffer would be zero; the changes in land use from creating this buffer (including fence construction, structure demolition, and fuelbreak creation) are considered a permanent land use impact.

[9] The Delevan Transmission Line and the Delevan Pipeline would not have an associated buffer. These two Project facilities do not require additional lands for long-term operation and maintenance.

20.3.3.2 Methodology

For the Extended Study Area, Project operational modeling results were reviewed to determine the expected changes in water deliveries and what those changes could mean relative to existing land uses.

For the Primary Study Area, the methodology used for assessing changes to land use, compatibility with Zoning and FMMP land use designations, and Williamson Act contract and WRP easement status of parcels that would be potentially affected by Project facilities (all three alternatives) was a multi-step process.

Project facilities that would be located near each other were grouped to prevent double-counting acreages. Acreages of the groups and associated construction disturbance areas around them were calculated using GIS. In instances where the coordinate space was not defined for specific proposed Project facility footprints or construction activity areas, assumptions were made regarding size and potential location.

The following Project facilities had spatially defined construction disturbance areas: Delevan and TRR pipelines, Delevan Transmission Line, Electrical Distribution Lines, and Road Relocations. For all other Project facilities (except for Sites Reservoir and the Project Buffer), the construction disturbance area associated with Alternatives A, B, and C was calculated as the Project facility footprint plus additional acreage that was added to the facility footprint (an assumed 10 percent of the facility footprint). Because the 10 percent additional acreage could be located in any area surrounding a Project facility, “potentially affected” parcels were identified and a list was created through a mapping review of the adjacent and overlapping parcel data.

To calculate permanent disturbance to land uses from the Project (Alternatives A, B, and C), the Project facility groupings were combined using a Union tool in GIS, which enabled all overlap between permanent facility footprints and the Project Buffer to be defined and eliminated prior to comparison with the agency datasets (i.e. Zoning, FMMP land use designations, Williamson Act contract status, and WRP easement status).

Subsequently, the consistency of Project facilities (including construction, operation, and maintenance activities) with the Zoning FMMP designated land uses and the counties’ General Plans’ policies was evaluated. In addition, the parcels where Project facilities would be constructed that have Williamson Act contracts and/or WRP easements were identified. Finally, the compatibility of Project facilities (including construction, operation, and maintenance activities) with existing land uses at and near those facility locations was evaluated.

It should be noted that the acreages presented in this chapter do not match acreages presented in other chapters in this EIR/EIS for every Project facility. This discrepancy is due to the necessary difference in methodology used to account for temporary and permanent impacts for the various environmental resources.

20.3.4 Topics Eliminated from Further Analytical Consideration

San Luis Reservoir is not discussed in the Extended Study Area for the No Project/No Action Alternative and Alternatives A, B, and C because changes to San Luis Reservoir storage conditions would have no effect on any of the land use issues being evaluated in this chapter.

Because no Project facilities would be constructed or maintained within the Extended Study Area for Alternatives A, B, and C, only operational impacts were discussed in the impacts analysis for the Extended Study Area (i.e., construction and maintenance impacts were not discussed).

The Secondary Study Area is not discussed for the No Project/No Action Alternative and Alternatives A, B, and C, as related to Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay because reservoir storage conditions and flow regime changes of those CVP/SWP reservoirs, rivers, creeks, and associated floodplains would have no effect on land use issues.

Land use changes and their compatibility with existing and General Plan designated land uses (**Impact Land-3)** are not relevant to the Primary Study Area for the No Project/No Action Alternative (and are, therefore, not discussed) because the projects and programs that are included in the No Project/No Action Alternative are not located within the Primary Study Area.

Established communities (**Impact Land-1)** are not discussed for the Primary Study Area for Alternatives A, B, and C except in the Sites Reservoir Inundation Area and Sites Reservoir Dams discussion; that criterion is not relevant to any other Project facility. The Town of Sites (which exists within the proposed footprint of the Sites Reservoir Inundation Area) is the only established community within the Primary Study Area.

20.3.5 Impacts Associated with the No Project/No Action Alternative

20.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, and Wildlife Refuge Water Use

Operational modeling of the No Project/No Action Alternative indicates that the change in CVP agricultural water supply deliveries between the No Project/No Action Alternative and Existing Conditions would range between -17 and 1 percent (indicating that the change could range from a decrease to a slight increase, when compared to Existing Conditions), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared. The change in SWP agricultural water supply deliveries between the No Project/No Action Alternative and Existing Conditions is predicted to range between -6 and 0 percent (indicating that the change could be a minor decrease ranging to no change, when compared to Existing Conditions), also depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Operational modeling of the No Project/No Action Alternative indicates that the change in CVP M&I water supply deliveries between the No Project/No Action Alternative and Existing Conditions would range between 0 and 149 percent (indicating that there could be no change and ranging to a substantial increase), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared. The change in SWP M&I water supply deliveries between the No Project/No Action Alternative and Existing Conditions is predicted to range between -11 and 4 percent (indicating that the change could be a decrease ranging to a slight increase, when compared to Existing Conditions), also depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Impact Land-1: Physical Division of an Established Community

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. With implementation of the No Project/No Action Alternative, CVP and SWP agricultural and M&I water supply deliveries within the Extended Study Area are predicted to change, when compared to Existing Conditions.

Operational modeling indicates that agricultural water deliveries (either CVP or SWP) in the Extended Study Area are predicted to decline or be approximately the same. These changes could result in a reduction in agricultural production, but not necessarily fewer acres of land in agricultural land use over the long-term, and not necessarily a change in land use from agriculture to another developed use. Reduced agricultural production could include, but may not be limited to, fewer acres of land cropped during Dry water years (i.e., periodic land fallowing), growing less water-intensive crops, or cropping land parcels fewer times per year.

CVP M&I water deliveries are expected to increase substantially in the Sacramento Valley and San Francisco Bay hydrologic regions; no change is expected in the San Joaquin River and Tulare Lake hydrologic regions. SWP M&I water deliveries are expected to decline or increase slightly throughout the hydrologic regions.

CVP Level 4 water deliveries to the wildlife refuges are expected to increase with implementation of the No Project/No Action Alternative, when compared to Existing Conditions. Changes in water deliveries to the wildlife refuges, whether they are increases or decreases, would not affect established communities because wildlife refuges do not have residential, commercial, and/or industrial development within their boundaries.

Regardless of the expected changes (increase or decrease) in water deliveries throughout the Extended Study Area as a result of implementing the No Project/No Action Alternative, the impacts of the projects included in the No Project/No Action Alternative have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to existing land uses has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on established communities, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Urbanization that is planned according to County and City General Plans and zoning codes could be expected to cause the conversion of open space, agricultural, and rural residential land uses to M&I land uses (i.e., residential, commercial, industrial land uses). However, the General Plans and related construction activities would be subject to their own environmental reviews. Therefore, population growth associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on established communities, when compared to Existing Conditions.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with land use plans, policies, and regulations.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential land use changes associated with the projects and programs included in the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland conversions.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with agricultural use zoning and Williamson Act Contracts.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with forest land and timberland zoning.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland and forest land conversions.

20.3.5.2 Primary Study Area – No Project/No Action Alternative

Impact Land -1: Physical Division of an Established Community

If the No Project/No Action Alternative is implemented, the Project would not be constructed, and there would, therefore, be no construction, operation, or maintenance impacts within the Primary Study Area. Therefore, **there would not be a substantial adverse effect** on established communities, when compared to Existing Conditions.

Land uses that currently exist within the Primary Study Area, including, but not limited to, residential, agricultural, open space, and grazing, are expected to continue. Growth that may occur within the Primary Study Area, and its associated land uses, is expected to be in accordance with Glenn and Colusa counties' General Plans. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

In addition, projects included within the No Project/No Action Alternative would not be located within the Primary Study Area, and therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with land use plans, policies, and regulations.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland conversions.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with agricultural use zoning and Williamson Act Contracts.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with forest land and timberland zoning.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland and forest land conversions.

20.3.6 Impacts Associated with Alternative A

20.3.6.1 Extended Study Area – Alternative A

<u>Operation Impacts</u>

With implementation of Alternative A, CVP and SWP agricultural water supply deliveries within the Extended Study Area are predicted to change, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operational modeling indicates that the change in CVP agricultural water supply deliveries between Alternative A and Existing Conditions would range between -8 and 3 percent (indicating that the change could be a minor decrease ranging to a slight increase, when compared to Existing Conditions), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared. The change in SWP agricultural water supply deliveries between Alternative A and Existing Conditions is predicted to range between -1 and 9 percent (indicating that the change could be a slight decrease to a slight increase), also depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Project operational modeling also indicates that the change in CVP agricultural water supply deliveries between Alternative A and the No Project/No Action Alternative would range between 2 and 11 percent (indicating that the change could be an increase up to a minor amount), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared. The change in SWP agricultural water supply deliveries between Alternative A and the No Project/No Action Alternative would range between 0 and 13 percent (indicating that there could be no change, ranging to a minor increase), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Agricultural Water Use

Impact Land -1: Physical Division of an Established Community

Alternative A's potential to increase agricultural water supply reliability and increase deliveries to agricultural land uses in the Extended Study Area is not likely to result in land use agencies within those jurisdictions planning to develop lands into agricultural land uses because much of the change in water deliveries is focused on the driest years (increasing water supply reliability thus decreasing the probability of developing additional acres of agricultural land uses). It is predicted that 19,000 fewer acres of agricultural land would result, when comparing Alternative A to Existing Conditions, and 2,000 additional acres of agricultural land are predicted to result when comparing Alternative A to the No Project/No Action Alternative (refer to Chapter 22 Socioeconomics for information regarding the 19,000-acre decrease and associated increase in crop production value, as well as the 2,000-acre increase and associated increase in crop production value).

The applicable land use agency would determine the plan for the land development in its community. Planned changes in land use, including those that would physically divide an established community if that was to occur, would undergo environmental review and approval, pursuant to CEQA and/or NEPA. This would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Land use changes that may occur within the Extended Study Area as a result of increased agricultural water supply reliability and increased water deliveries would be subject to applicable land use plans, policies, and regulations of the agency with jurisdiction over the lands where the land use changes could occur. Environmental analyses pursuant to CEQA and/or NEPA of such land use changes, if they were to occur, would include the review of relevant adopted zoning ordinances, General Plans, and maps for consistency with such regulations. Providing increased agricultural water supply reliability and deliveries within the CVP/SWP service areas of the Extended Study Area would not cause conflicts with these jurisdictional analyses. Therefore, **no impact** would occur, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-2** discussion. That discussion is also applicable to the compatibility of land use changes expected as a result of Project implementation with existing and General Plan-designated land uses.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Providing increased agricultural water supply reliability and deliveries within the CVP/SWP service areas, as a result of implementation of Alternative A, is not expected to result in the conversion of FMMP-designated Farmland to a non-agricultural use. If that were to occur, environmental analyses pursuant to CEQA and/or NEPA of such land use changes would occur. There would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of lands that have a Williamson Act Contract

Providing increased agricultural water supply reliability and deliveries within the CVP/SWP service areas would not result in a conflict with the existing Agricultural zoning in the counties located within the Extended Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Providing increased agricultural water supply reliability and deliveries within the CVP/SWP service areas is not expected to affect forest land or forest land production because, as indicated in the **Impact Land-1** discussion, there would be little change expected to land uses (due to Alternative A's focus on providing water supply reliability) as a result of implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, Alternative A is not expected to result in a conflict with the existing zoning of forest land in the counties located within the Extended Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide

Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-4**, **Impact Land-5**, and **Impact Land-6** discussions. That discussion is also applicable to farmland and forest land conversions.

Municipal and Industrial Water Use

With implementation of Alternative A, CVP and SWP M&I water supply deliveries within the Extended Study Area are predicted to change, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operational modeling indicates that the change in CVP M&I water supply deliveries between Alternative A and Existing Conditions would range between 0 and 151 percent[10] (indicating that there could be no change and ranging to a substantial increase), depending on hydrologic region and whether long-term averages or Dry and Critical[11] averages are compared. The change in SWP M&I water supply deliveries between Alternative A and Existing Conditions is predicted to range between 0 and 9 percent (indicating that the change could range from no change to a minor increase, when compared to Existing Conditions), also depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Project operational modeling also indicates that the change in CVP M&I water supply deliveries between Alternative A and the No Project/No Action Alternative would range between 0 and 1 percent (indicating that there could be no change or a slight change), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared. The change in SWP M&I water supply deliveries between Alternative A and the No Project/No Action Alternative would range between 5 and 16 percent (indicating that the change could be a slight to minor increase, when compared to Existing Conditions), depending on hydrologic region and whether long-term averages or Dry and Critical averages are compared (refer to Chapter 6 Surface Water Resources for details).

Impact Land -1: Physical Division of an Established Community

Alternative A's potential to increase M&I water supply reliability and increase deliveries to M&I land uses in the Extended Study Area could result in land use agencies within those jurisdictions planning to develop lands into M&I land uses, although much of the change in water deliveries would occur during the driest years (increasing water supply reliability and decreasing the probability of developing additional acres of M&I land uses). This is not expected to induce growth; it is instead expected to accommodate growth that is planned by local land use agencies. The applicable land use agency would determine the plan for the land development in its community. Planned changes in land use, including those that would physically divide an established community, would undergo environmental review and approval, pursuant to CEQA and/or NEPA. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

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[10] It should be noted that the majority of this change would occur between Existing Conditions and the No Project/No Action Alternative, with a minor amount of change expected to occur between the No Project/No Action Alternative and Alternative A.

[11] It should be noted that much of the change would occur during the driest years (i.e., Project water would be provided during those years to provide reliability), so additional acreage may not be converted to M&I land uses.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

If land use agencies approve land use changes as a result of Alternative A's potential to increase water supply reliability and increase deliveries to M&I land uses in the Extended Study Area, those land use changes would be expected to comply with that agency's land use plans, policies, and regulations, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-2** discussion. That discussion is also applicable to the compatibility of land use changes expected as a result of Project implementation with existing and General Plan-designated land uses.

Impact Land-4: Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

If land use agencies approve land use changes as a result of Alternative A's potential to increase water supply reliability and increase deliveries to M&I land uses in the Extended Study Area, and those land use changes result in the conversion of FMMP-designated Farmland to a non-agricultural use, those proposed land use changes would undergo environmental review and approval, pursuant to CEQA and/or NEPA. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, or the Permanent Conversion of Lands that have a Williamson Act Contract

If land use agencies approve land use changes as a result of Alternative A's potential to increase water supply reliability and increase deliveries to M&I land uses in the Extended Study Area, those land use changes would be expected to comply with that agency's existing zoning and applicable Williamson Act Contract provisions, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

If land use agencies approve land use changes as a result of Alternative A's potential to increase water supply reliability and increase deliveries to M&I land uses in the Extended Study Area, those land use changes would be expected to not conflict with zoning for forest land or timberland, or with timberland production. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-4**, **Impact Land-5**, and **Impact Land-6** discussions. Those discussions are also applicable to farmland and forest land conversions.

Wildlife Refuge Water Use

Impact Land -1: Physical Division of an Established Community

The provision of an alternate Level 4 wildlife refuge water supply, associated with implementation of Alternative A, would have no effect on established communities within the Extended Study Area. This is because Alternative A would continue to provide this water (an alternative source to what is currently provided) only to lands within the wildlife refuges. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

No conflicts are expected with land use plans, policies, or regulations that are applicable to the Extended Study Area from the continued delivery of water to the wildlife refuges because only the water source would potentially change. The action (water delivery), location of water delivery, and amount of water to be delivered would not change. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-1** discussion. That discussion is also applicable to the compatibility of land use changes expected as a result of Project implementation with existing and General Plan-designated land uses.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland conversions.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with agricultural use zoning and Williamson Act Contracts.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Refer to the **Impact Land-1** discussion. That discussion is also applicable to potential conflicts with forest land and timberland zoning.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-1** discussion. That discussion is also applicable to farmland and forest land conversions.

20.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Pump Installation at the Red Bluff Pumping Plant

Alternative A includes the installation of a pump into an existing concrete bay at the existing RBPP. The proposed additional pump would not increase the frequency of maintenance activities that are currently required at the pumping plant.

Impact Land -1: Physical Division of an Established Community

The RBPP is located within the land use footprint of an existing CVP facility owned and operated by Reclamation. No physical division of an established community would, therefore, occur as a result of the construction, operation, or maintenance of an additional pump or the maintenance dredging required for the Project. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

No conflicts with the Farmland Protection Policy Act, NRCS' WRP, and applicable Tehama County General Plan policies are expected (refer to Chapter 4 Environmental Compliance and Permit Summary for the list of applicable policies) from installing the Project pump into the existing RBPP. In addition, maintenance of the Project pump and dredging of the canal would occur when maintenance of the other RBPP facilities occurs, resulting in no conflicts. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Because the Project pump would be installed within the existing RBPP on land that is designated General Industrial by Tehama County, no changes in land use at the RBPP or adjacent parcels would occur as a result of the construction, operation, or maintenance of the pump, or maintenance dredging required for the Project. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

The existing RBPP (in which the pump is proposed to be installed) is not located on land that is FMMP-designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance; it is located on land that is designated as Urban/Built-Up. In addition, the Project's pump installation at the RBPP, as well as the pump's operation and maintenance and canal maintenance dredging required for the Project, would not require conversion of the existing FMMP-designated land use of the pumping plant site. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Because the Project pump would be installed within the existing RBPP site (land that is not zoned for agricultural use and does not have a Williamson Act contract), the pump's installation, operation, and maintenance, as well as canal maintenance dredging required for the Project, would not conflict with zoning for agricultural use or Williamson Act contract provisions. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Because the Project pump would be installed within the existing RBPP site (land that is not zoned for forest land, timberland, or timberland production), the pump's installation, operation, and maintenance, as well as canal maintenance dredging required for the Project, would not conflict with zoning for forest land or timberland, or with timberland production. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. That discussion is also applicable to forest land conversions.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-4**, **Impact Land-5**, and **Impact Land-6** discussions. Those discussions are also applicable to farmland and forest land conversions.

20.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge

As part of Project construction, 22 residences, four detached garages, one mobile home, 26 barns, and 37 other structures (a combination of sheds, silos, and a pump house) within the Sites Reservoir Inundation Area would be demolished. Existing septic tanks and other storage tanks would also be removed. In addition, two private cemeteries (Sites Cemetery and a Rancheria Cemetery) would be relocated, as well as many miles of fencing and asphalt would be removed. The roads that are currently routed through Antelope Valley would be re-routed, as necessary to provide alternate routes.

Table 20-1 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Sites Reservoir, Sites Reservoir Dams, and South Bridge.

Table 20-1
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	9	9
Colusa County	128	128
Undetermined[c]	12	0
Total	**149**	**137**
Acreage of Potentially Affected Parcels		
Glenn County	1,795	1,795
Colusa County	10,669	10,669
Undetermined[c]	1,000	0
Total	**13,464**	**12,464**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)		1,592
Foothill Agriculture/Forestry (144-acre minimum)		182
Colusa County		
Agriculture Preserve		10,535
Exclusive Agriculture		33
Foothill Agriculture/Forestry (144-acre minimum)		7
N/A		115
Total	**13,464[d]**	**12,464**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland		1,042
Grazing Land		727
Other Land		6
Colusa County		
Farmland of Local Importance		10,582
Other Land		107
Total	**13,464[d]**	**12,464**

Table 20-1
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge – Alternative A Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	8	8
Colusa County	66	66
Undetermined[c]	12	0
Total	**86**	**74**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County		1,606
Colusa County		9,286
Total	**11,892**[d]	**10,892**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]Undetermined values represent construction disturbance areas for which locations have not been determined. Reported undetermined values are the maximum number of additional parcels or acreages that would be temporarily affected.

[d]The temporarily affected acreages by zoning and FMMP designations, and by Williamson Act contracts, cannot be determined because it is unknown which parcels would comprise the 1,000-acre construction disturbance area. Reported total temporarily affected acreages are the sum of the permanently affected acres and the 1,000-acre construction disturbance area.

Notes:

FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Impact Land -1: Physical Division of an Established Community

Project construction includes the demolition of existing structures within Antelope Valley, the construction of dams to form Sites Reservoir, the construction of the South Bridge across the reservoir, and the filling of the reservoir. These activities would eliminate the town of Sites. Therefore, construction of Sites Reservoir (i.e., creating the inundation area), Sites Dams, and South Bridge would cause the physical division of an established community, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

No conflicts with the Farmland Protection Policy Act and NRCS' WRP are expected. The goals, objectives, and policies included in Glenn County's and Colusa County's General Plan land use elements have a strong focus on the preservation of agricultural land uses (refer to Chapter 4 Environmental Compliance and Permit Summary for the list of applicable policies). Colusa County's General Plan Land Use Element (Goal LU-4 and associated objectives and policies) also provide for the creation of Sites Reservoir, including action items to create a Sites Area Plan and the County's active participation in the Sites Joint Power Authority. Construction, operation, and maintenance of the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would, therefore, result in a **significant impact,** as related to Glenn County's

General Plan, and a **less-than-significant impact**, as related to Colusa County's General Plan, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Construction, operation, and maintenance of the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would result in changes in the existing agricultural, rural residential, and open space land uses, as well as to the General Plan-designated land uses from Glenn and Colusa County land use designations that promote agricultural land uses to recreational and public facility/industrial land uses. These expected changes in land use would be compatible with the existing surrounding land uses, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative. However, the expected changes would result in a **significant impact**, as related to the designated land uses, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

The Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would not result in the conversion of FMMP designated Prime Farmland to nonagricultural uses because this land use type does not occur in this area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of Sites Reservoir, its associated dams, and South Bridge would conflict with the zoning of land in Glenn County that is currently zoned as Agricultural Preserve and Foothill Agriculture/Forestry, and Agriculture Preserve, Exclusive Agriculture, and Foothill Agriculture/Forestry (144-acre minimum) in Colusa County. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, up to 86 parcels of land that have Williamson Act contracts would be affected during Project construction (a **less-than-significant impact**), and 74 parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance. This permanent long-term impact would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

In Glenn County, the applicable zoning designations are Foothill Agricultural/Forestry, Agricultural Preserve, or Recreational (Murrey, 2012). The zoning designations used in Colusa County for areas defined as Forest Land, Timberland, or Timberland zoned Timberland Production are Open Space, Upland Conservation, or Agriculture Preserve (Johanns, 2012).

Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would impact 1,774 acres currently zoned as Agricultural Preserve and Foothill Agriculture/Forestry in Glenn County and 10,542 acres of land designated as Agriculture Preserve and Foothill Agriculture/Forestry (144-acre minimum) in Colusa County. This would result in a zoning conflict, and would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. Due to the land being zoned for forest land, and because it is currently unknown how many of the acres of forest land that are currently zoned Agricultural Preserve, Foothill Agriculture/Forestry, and Agriculture Preserve, this is considered a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would change the existing environment of lands designated pursuant to the FMMP as Farmland of Local Importance and Local Potential Farmland. Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge would also change the existing environment of lands zoned as Foothill Agriculture/Forestry. These changes would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Table 20-2 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Recreation Areas.

Table 20-2
Recreation Areas – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	4	4
Colusa County	11	11
Total	**15**	**15**
Acreage of Potentially Affected Parcels		
Glenn County	293	293
Colusa County	877	877
Total	**1,170**	**1,170**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)	293	293
Colusa County		
Agriculture Preserve	877	877
Total	**1,170**	**1,170**

Table 20-2
Recreation Areas – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland	61	61
Grazing Land	232	232
Colusa County		
Farmland of Local Importance	811	811
Other Land	66	66
Total	**1,170**	**1,170**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	4	4
Colusa County	10	10
Total	**14**	**14**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	293	293
Colusa County	828	828
Total	**1,121**	**1,121**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. Construction, operation, and maintenance of the Saddle Dam Recreation Area, which would be located in Glenn County, would result in a **significant impact,** as related to Glenn County's General Plan, when compared to Existing Conditions and the No Project/No Action Alternative. Construction, operation, and maintenance of the remaining four recreation areas that would be located in Colusa County would result in a **less-than-significant impact**, as related to Colusa County's General Plan, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-3** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Recreation Areas.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

No Prime Farmland would be affected by construction, operation, or maintenance of the Recreation Areas because no Prime Farmland is located at the Recreation Area sites. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of the Recreation Areas would conflict with the zoning of land in Glenn County that is currently zoned as Agricultural Preserve, and Agriculture Preserve in Colusa County. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, up to 14 parcels of land that have Williamson Act contracts would be affected during Project construction (a **less-than-significant impact**), and during Project operation and maintenance. This permanent long-term impact would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Refer to the **Impact Land-6** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Recreation Areas (acreages applicable to Recreation Areas are provided in Table 20-2).

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-7** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Recreation Areas (acreages applicable to Recreation Areas are provided in Table 20-2).

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-8** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Recreation Areas.

Road Relocations and Terminal Regulating Reservoir Pipeline Road

Table 20-3 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing and operating/maintaining the Alternative A Road Relocations and TRR Pipeline Road.

Table 20-3
Road Relocations and Terminal Regulating Reservoir Pipeline Road – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	12	13
Colusa County	45[d]	39
Total	**57**	**52**
Acreage of Potentially Affected Parcels		
Glenn County	215	81
Colusa County	670	206
Total	**885**	**287**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)	131	55
Agricultural Preserve (72-acre minimum)	68	15
N/A	16	11
Colusa County		
Agriculture Preserve	668	206
N/A	2	0[c]
Total	**885**	**287**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland	87	30
Grazing Land	128	51
Other Land	0[c]	0[c]
Colusa County		
Farmland of Local Importance	669	206
Other Land	0[c]	0
Total	**885**	**287**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	11	12
Colusa County	41	36
Total	**52**	**48**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	195	69
Colusa County	648	198
Total	**843**	**267**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

Table 20-3
Road Relocations and Terminal Regulating Reservoir Pipeline Road – Alternative A Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is less than one acre in these categories, but more than zero.

[d]Differences between temporary and long-term acreages for these categories are due to the TRR Pipeline Road being located within the Delevan and TRR Pipeline disturbance area, thus having no construction disturbance area of its own. This also applies to the differences in the number of parcels affected.

Notes:
FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. The Colusa County discussion is also applicable to portions of the Road Relocations and the entire length of the TRR Pipeline Road. The portions of the Road Relocations that would be constructed, operated, and maintained in Glenn County would result in a **significant impact**, as related to Glenn County's General Plan, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

Refer to the **Impact Land-3** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Road Relocations and TRR Pipeline Road.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

No Prime Farmland would be affected by construction, operation, or maintenance of the Road Relocations and TRR Pipeline Road because no Prime Farmland is located along those alignments. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Operation and maintenance of the Road Relocations and TRR Pipeline Road would conflict with the zoning of land in Glenn County that is currently zoned as Agricultural Preserve, and Agriculture Preserve in Colusa County. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, up to 52 parcels of land that have Williamson Act contracts would be affected during Project construction (a **less-than-significant impact**), and 48 parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance. This permanent long-term impact would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Refer to the **Impact Land-6** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Road Relocations and TRR Pipeline Road (acreages applicable to Road Relocations and TRR Pipeline Road are provided in Table 20-3).

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Site visits to the area did not reveal forest land that would be affected by the Project. Therefore, there would be no permanent loss of forest, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Road Relocations and TRR Pipeline Road would change the existing environment of lands designated pursuant to the FMMP as Farmland of Local Importance, and Local Potential Farmland (acreages are presented in Table 20-3). This would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant

Table 20-4 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing and operating/maintaining the Alternative A Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant.

Table 20-4
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	0[c]	7
Acreage of Potentially Affected Parcels		
Colusa County	0[c]	89
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	0[c]	89
Total	**0**[c]	89

Table 20-4
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Farmland of Local Importance	0[c]	89
Total	**0**[c]	89
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	6
Total	**0**[c]	**6**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	79
Total	**0**[c]	79
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All construction disturbance area numbers for this Project facility grouping are zero because the construction disturbance area for this grouping would be within the Sites Reservoir construction disturbance area. It is noted that the actual construction disturbance area for this grouping would be 99 acres within the 1,000-acre construction disturbance area (90 acres plus 10 percent).

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant, as that discussion pertains to Colusa County.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The construction and operation/maintenance of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant would result in changes in the existing agricultural and open space land uses, as well as to the General Plan-designated land uses from Colusa County land use designations that promote agricultural land uses to public facility/industrial land uses. These expected changes in land use would be compatible with the existing surrounding land uses, resulting in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No

Action Alternative. The expected changes would result in a **significant impact**, as related to the designated land uses, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

No Prime Farmland in Colusa County would be affected by construction, operation, or maintenance of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant because these Project facilities would not be located on Prime Farmland. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant would conflict with the zoning of land in Colusa County that is currently zoned as Agriculture Preserve. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, no parcels of land that have Williamson Act contracts would be affected during Project construction (due to these facilities being constructed within the construction disturbance area of the Sites Reservoir Inundation Area and Sites Reservoir Dams), which would result in a **less-than-significant impact.** Six parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance. This permanent long-term impact would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant would impact 89 acres designated Agriculture Preserve in Colusa County. This would result in a zoning conflict, and would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Site visits to the area did not reveal forest land. Therefore, there would be no permanent loss of forest, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant would change the existing environment of lands designated pursuant to the FMMP as Farmland of Local Importance (acreages are presented in Table 20-4). This would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard

Table 20-5 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard.

Table 20-5
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	0[c]	14
Acreage of Potentially Affected Parcels		
Colusa County	0[c]	348
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	0[c]	92
Exclusive Agriculture	0[c]	256
Total	**0**[c]	**348**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	0[c]	115
Farmland of Local Importance	0[c]	233
Total	**0**[c]	**348**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	3
Total	**0**[c]	**3**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	5
Total	**0**[c]	**5**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

Table 20-5
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All construction disturbance area numbers for this Project facility grouping are zero because the construction disturbance area for this grouping would be within the Delevan Pipeline/TRR Pipeline construction disturbance area. It is noted that the actual construction disturbance area for this grouping would be 383 acres within the pipeline construction disturbance area (348 acres plus 10 percent).

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard, as that discussion pertains to Colusa County.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The construction, operation, and maintenance of the Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard would result in changes in the existing agricultural and open space land uses (but not to the water land use of Funks Reservoir), as well as to the General Plan-designated land uses from Colusa County land use designations that promote agricultural land uses to public facility/industrial land uses. These expected changes in land use would be compatible with the existing surrounding land uses, resulting in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. The expected changes would result in a **significant impact**, as related to the designated land uses, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Approximately 115 acres of Prime Farmland in Colusa County would be affected by operation and maintenance of the Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of the Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard would conflict with the zoning of land in

Colusa County that is currently zoned as Agriculture Preserve and Exclusive Agriculture. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, no parcels of land that have Williamson Act contracts would be affected during Project construction (due to these facilities being constructed within the construction disturbance area of the Delevan and TRR pipelines), which would result in a **less-than-significant impact.** Three parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance. This permanent long-term impact would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard would impact 92 acres of land designated Agriculture Preserve and 256 acres of land designated Exclusive Agriculture in Colusa County. This would result in a zoning conflict, and would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Site visits to the area did not reveal forest land. Therefore, there would be no permanent loss of forest, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard would change the existing environment of lands designated pursuant to the FMMP as Prime Farmland and Farmland of Local Importance (acreages are presented in Table 20-5). This would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Table 20-6 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of construction, operation, and maintenance activities associated with modifications to the Alternative A GCID Canal Facilities.

Table 20-6
Glenn-Colusa Irrigation District Canal Facilities Modifications[c] – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	0[c]	3
Acreage of Potentially Affected Parcels		
Glenn County	0[c]	1
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
No Information Available		1
Intensive Agriculture		0[d]
Total	**5[c]**	**1**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Prime Farmland	0[d]	0[d]
Farmland of Statewide Importance	0[d]	0[d]
Farmland of Local Importance	0[d]	0[d]
Urban/Built-Up Land	1	0[d]
Other Land	3	1
Total	**5[c]**	**1**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	0
Total	**0**	**0**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County		
Total	**0**	**0**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]Includes the canal headgate, canal lining, and railroad siphon.

[d]There is less than one acre in these categories, but more than zero.

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

The proposed modifications would occur at the existing GCID Canal (which is zoned as Canal or is unzoned). Such modifications would not conflict with Glenn County's focus on agricultural production, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The modifications to the existing GCID Canal Facilities (headgate structure, canal lining, and railroad siphon) would not result in changes in the existing public facility/industrial land use of the Canal Facilities. The existing Canal Facilities are located in an undesignated area that is surrounded by the Intensive Agriculture land use designation by Glenn County, so proposed modifications to those facilities (which would occur only within the Canal) would be compatible with the General Plan-designated land use. Therefore, the proposed GCID Canal Facilities Modifications would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Land in the southeast corner of the railroad siphon footprint is designated Prime Farmland in Glenn County. Because this is a proposed replacement of an existing railroad siphon and would be within the Canal, no conversion of lands would occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

The modifications to the existing GCID Canal Facilities (headgate structure, canal lining, and railroad siphon) would not result in changes in the existing public facility/industrial land use of the Canal Facilities. The existing Canal Facilities are located in an unzoned area that is surrounded by land currently zoned as Exclusive Agriculture by Glenn County, so proposed modifications to those facilities (which would occur only within the Canal) would be compatible with the County zoning. Therefore, the proposed GCID Canal Facilities Modifications would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

No parcels of land that have Williamson Act contracts would be affected during Project construction, which would result in **no impact.** In addition, no parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance; therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

Because the Canal is not zoned, the GCID Canal Facilities Modifications would result in no conflict with existing zoning. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

The GCID Canal is not considered forest land. Therefore, there would be no loss of forest land from the GCID Canal Facilities Modifications, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The railroad siphon footprint is FMMP-designated primarily Urban/Built-Up Land, with slivers of land designated Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance. The Canal lining and headgate structure footprint is FMMP-designated Other Land. Because these modifications are to existing facilities and would be within the Canal, no conversion of lands would occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, and Terminal Regulating Reservoir Electrical Switchyard

Table 20-7 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing and operating/maintaining the Alternative A TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard.

Table 20-7
Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir to Funks Creek Pipeline, Terminal Regulating Reservoir to Funks Creek Outlet, and Terminal Regulating Reservoir Electrical Switchyard – Alternative A Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	0[c]	9
Acreage of Potentially Affected Parcels		
Colusa County	0[c]	195
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Exclusive Agriculture	0[c]	194
N/A	0[c]	1
Total	**0[c]**	**195**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	0[c]	194
Farmland of Local Importance	0[c]	1
Other Land	0[c]	0[d]
Total	**0[c]**	**195**

Table 20-7
Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir to Funks Creek Pipeline, Terminal Regulating Reservoir to Funks Creek Outlet, and Terminal Regulating Reservoir Electrical Switchyard – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	0
Total	**0[c]**	**0**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0[c]	0
Total	**0[c]**	**0**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All construction disturbance area numbers for this Project facility grouping are zero because the construction disturbance area for this grouping would be within the Delevan Pipeline/TRR Pipeline and TRR construction disturbance areas. It is noted that the actual construction disturbance area for this grouping would be 214 acres (195 acres plus 10 percent).

[d]There is less than one acre in this category, but more than zero.

Notes:

FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard, as that discussion pertains to Colusa County.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The construction, operation, and maintenance of the TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard would result in changes in the existing agricultural and open space land uses, as well as to the General Plan-designated land uses from Colusa County land use designations that promote agricultural land uses to public facility/industrial land uses. These expected changes in land use would be compatible with the existing surrounding land uses, resulting in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. The expected changes would result in a **significant impact**, as related to the designated land uses, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Approximately 194 acres of Prime Farmland in Colusa County would be affected by operation/maintenance of the TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of the TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard would conflict with the zoning of land in Colusa County that is currently zoned as Exclusive Agriculture. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

No parcels of land that have Williamson Act contracts would be affected during Project construction, which would result in **no impact.** In addition, no parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance; therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard would impact 194 acres designated as Exclusive Agriculture in Colusa County, which is not considered to be forest land. This would, therefore, result in no conflict, and would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

The lands that TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard would be located on do not have forest land, so no conversion of forest land to non-forest use would occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, and TRR Electrical Switchyard would change the existing environment of lands designated pursuant to the FMMP as Prime Farmland and Farmland of Local Importance (acreages are presented in Table 20-7). This would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline and Terminal Regulating Reservoir Pipeline

Table 20-8 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Delevan Pipeline and the TRR Pipeline.

Table 20-8
Delevan Pipeline and Terminal Regulating Reservoir Pipeline – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b, c]
Number of Potentially Affected Parcels		
Colusa County	64	0
Acreage of Potentially Affected Parcels		
Colusa County	2,058	0
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Exclusive Agriculture	2,015	0
Light or Heavy Industrial	19	0
N/A	24	0
Total	**2,058**	**0**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	957	0
Unique Farmland	1,001	0
Farmland of Local Importance	46	0
Other Land	54	0
Total	**2,058**	**0**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	11	0
Total	**11**	**0**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	425	0
Total	**425**	**0**
Number of Potentially Affected Parcels with WRP Easements	**1**	**0**
Number of Potentially Affected Acres with WRP Easements	**5**[d]	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All permanent impact numbers for this Project facility grouping are zero because these are underground facilities.

[d]The actual WRP easement that would be affected during Project construction is 4.6 acres.

Notes:
FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Delevan Pipeline and TRR Pipeline, as that discussion pertains to the Farmland Protection Policy Act and Colusa County's General Plan. The Delevan Pipeline and TRR Pipeline would not be located within Glenn County, so that County's General Plan is not applicable to this Project facility.

The Delevan Pipeline would cross one parcel that has a WRP easement. During the Project construction period, 4.6 acres of WRP easement land would be affected, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the Delevan Pipeline would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative because the periodically spaced blowoff valves and similar valves along the pipeline would be installed to avoid on-site wetlands.

Construction, operation, and maintenance of the TRR Pipeline would not affect any parcels that have a WRP easement, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The Delevan Pipeline and TRR Pipeline would result in changes in the existing agricultural and open space land uses during only the Project construction period, resulting in a **significant impact** during that time, when compared to Existing Conditions and the No Project/No Action Alternative. Other than providing access to periodically spaced blowoff valves and similar valves along the pipelines, the pipelines would be underground facilities that would not result in permanent impacts to the existing land uses (i.e., the pipelines would be compatible with existing land uses) during the Project operation and maintenance period, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, construction of the pipelines would be incompatible with the Colusa County General Plan-designated land uses, resulting in a **significant impact** during the Project construction period, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the pipelines would be compatible with the General Plan-designated land uses, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Prime Farmland exists along the proposed pipeline alignments. However, no Prime Farmland would be permanently affected by operation or maintenance of the pipelines because they would be installed underground, thus allowing existing land uses to continue after Project construction is complete. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

There would be no permanent conflicts with existing agricultural zoning or Williamson Act contracts from pipeline operation and maintenance because they would be installed underground. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

There would be no permanent conflicts with existing forest land zoning from pipeline operation and maintenance because they would be installed underground. In addition, the land that the pipelines would cross is not zoned for forest land. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

There would be no permanent loss of forest land from the pipelines' operation and maintenance because they would be installed underground. In addition, the land that the pipelines would cross is not zoned for forest land, indicating that forest land does not exist along the pipelines' alignment. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Delevan Pipeline and TRR Pipeline would only temporarily change the existing environment of lands designated pursuant to the FMMP as Prime Farmland, Unique Farmland, and Farmland of Local Importance (acreages are presented in Table 20-8) during Project construction. Because the pipelines would be installed underground, no permanent conversion of farmland or forest land is expected, except where periodically spaced blowoff valves and similar valves would be installed, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

The Alternative A Delevan Transmission Line would parallel, and be completely within the construction disturbance area of, the proposed Delevan Pipeline, with the exception of the westernmost 3.5 miles. Because the impacts of the eastern approximately nine miles of the proposed transmission line route construction disturbance area are already accounted for in the impact assessment for the Delevan Pipeline, only the remaining 3.5 miles of the transmission line are evaluated here. Table 20-9 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Delevan Transmission Line.

Table 20-9
Delevan Transmission Line – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	12	39[c]
Acreage of Potentially Affected Parcels		
Colusa County	71	3[c]
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	31	
Exclusive Agriculture	40	
Total	**71**	**3[c]**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	2	
Farmland of Local Importance	70	
Total	**71**	**3[c]**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	7	11[c]
Total	**7**	**11[c]**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	54	3[c]
Total	**54**	**3[c]**
Number of Potentially Affected Parcels with WRP Easements	**1**	**0**
Number of Potentially Affected Acres with WRP Easements	**2[d]**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]Because the placement of the transmission line towers is currently not known, each parcel along the alignment would be potentially affected, resulting in 2.5 acres actual permanent disturbance.

[d]The actual WRP easement that would be affected during Project construction is 2.3 acres.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Delevan Transmission Line, as that discussion pertains to the Farmland Protection Policy Act and Colusa County's General Plan. The transmission line would not be located within Glenn County, so that County's General Plan is not applicable to this Project facility.

The Delevan Transmission Line would cross one parcel that has a WRP easement. During the Project construction period, 2.3 acres of WRP easement land would be affected, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the Delevan Transmission Line would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative because the transmission line towers would be installed so they span the parcel, and access to the towers for maintenance would be infrequent and would be routed to avoid on-site wetlands.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The Delevan Transmission Line would result in changes in the existing agricultural and open space land uses during only the Project construction period, resulting in a **significant impact** during that time, when compared to Existing Conditions and the No Project/No Action Alternative. Other than providing access to periodically spaced transmission line towers along the alignment, the transmission line would not result in permanent impacts to the existing land uses (i.e., it would be compatible with existing land uses) during the Project operation and maintenance period, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, construction of the transmission line would be incompatible with the Colusa County General Plan-designated land uses, resulting in a **significant impact** during the Project construction period, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the transmission line would be compatible with the General Plan-designated land uses, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Prime Farmland exists along the proposed transmission line alignment. However, due to the few acres of Prime Farmland (i.e., less than two acres) that would be affected by Project construction, and the fact that the transmission line tower footings would impact a total of 2.5 acres of land along the entire transmission line alignment, it may be possible to construct the transmission line tower footings on land that is not designated as Prime Farmland. After Project construction is complete, existing land uses could continue. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Minimal permanent conflicts are expected with existing agricultural zoning (resulting in a **less-than-significant impact** relative to zoning) or Williamson Act contracts from transmission line operation and maintenance because the transmission line tower footings would permanently impact a total of 2.5 acres of land along the entire transmission line alignment, and could permanently affect 11 parcels of land that have Williamson Act contracts. Due to the potential conflicts, this is considered a **significant impact** relative to Williamson Act contracts, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Delevan Transmission Line would impact 31 acres of land designated Agriculture Preserve in Colusa County. This would result in a zoning conflict, and would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. The land is, therefore, zoned for forest land. However, site visits to the area did not reveal forest land. Therefore, there would be no permanent loss of forest, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Delevan Transmission Line would temporarily change the existing environment of lands designated pursuant to the FMMP as Prime Farmland, Unique Farmland, and Farmland of Local Importance (acreages are presented in Table 20-9). This would occur during the Project construction period, and would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Table 20-10 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Delevan Pipeline Intake Facilities.

Table 20-10
Delevan Pipeline Intake Facilities – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	0[c]	2
Acreage of Potentially Affected Parcels		
Colusa County	0[c]	19
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Exclusive Agriculture	0[c]	15
Floodway	0[c]	4
Total	**0[c]**	**19**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	0[c]	13
Other Land	0[c]	6
Total	**0[c]**	**19**

Table 20-10
Delevan Pipeline Intake Facilities – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0	0
Total	**0**	**0**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0	0
Total	**0**	**0**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All construction disturbance area numbers for this Project facility grouping are zero because the construction disturbance area for this grouping would be within the adjacent Delevan Pipeline construction disturbance area. It is noted that the actual construction disturbance area for this grouping would be 17.1 acres within the pipeline construction disturbance area (it would be smaller than the permanent facility footprint because of an overlap between the Delevan Pipeline construction disturbance area and Delevan Pipeline Intake Facilities permanent facility footprint).

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Delevan Pipeline Intake Facilities, as that discussion pertains to Colusa County.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The Delevan Pipeline Intake Facilities would result in changes in the existing agricultural and floodway land uses during Project construction, operation, and maintenance periods, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, the current design, construction activities, and location of the proposed Delevan Pipeline Intake Facilities would potentially conflict with the operation of the existing Maxwell Irrigation District facilities located adjacent on the upstream side of the proposed facilities. This would result in a **potentially significant impact** on that land use, when compared to Existing Conditions and the No Project/No Action Alternative.

The Delevan Pipeline Intake Facilities would be incompatible with the Colusa County General Plan-designated land uses, resulting in a **significant impact** during the Project construction, operation, and maintenance periods, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Approximately 13 acres of Prime Farmland in Colusa County would be affected by operation and maintenance of the Delevan Pipeline Intake Facilities, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Construction, operation, and maintenance of the Delevan Pipeline Intake Facilities would conflict with the zoning of land in Colusa County that is currently zoned as Exclusive Agriculture. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

No parcels of land that have Williamson Act contracts would be affected during Project construction, which would result in **no impact.** In addition, no parcels of land that have Williamson Act contracts would be affected during Project operation and maintenance; therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Delevan Pipeline Intake Facilities would impact 15 acres designated Exclusive Agriculture in Colusa County (which is not considered to be forest land). This would, therefore, result in no conflict, and would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

The lands that the Delevan Pipeline Intake Facilities would be located on do not have forest land, so no conversion of forest land to non-forest use would occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Delevan Pipeline Intake Facilities would permanently change the existing environment of approximately 13 acres of land designated pursuant to the FMMP as Prime Farmland. This would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Electrical Distribution Lines

Table 20-11 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative A Electrical Distribution Lines.

Table 20-11
Electrical Distribution Lines – Alternative A
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	16	16[d]
Acreage of Potentially Affected Parcels		
Colusa County	27	0[c]
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	27	
Total	**27**	**0**[c]
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Farmland of Local Importance	26	
Other Land	0[c]	
Total	**27**	**0**[c]
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	16	16[d]
Total	**16**	**16**[d]
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	27	0[c]
Total	**27**	**0**[c]
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is less than one acre in this category, but more than zero.

[d]Because the placement of the electrical distribution lines is currently not known, each parcel along the alignment would be potentially affected.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Electrical Distribution Lines, as that discussion pertains to Colusa County.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The Electrical Distribution Lines would result in changes in the existing agricultural and open space land uses during only the Project construction period, resulting in a **significant impact** during that time, when compared to Existing Conditions and the No Project/No Action Alternative. Other than providing access to the distribution line poles along the alignments, the distribution lines would not result in permanent impacts to the existing land uses (i.e., it would be compatible with existing land uses) during the Project operation and maintenance period, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, construction of the distribution lines would be incompatible with the Colusa County General Plan-designated land uses, resulting in a **significant impact** during the Project construction period, when compared to Existing Conditions and the No Project/No Action Alternative. Operation and maintenance of the distribution lines would be compatible with the General Plan-designated land uses, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

Prime Farmland does not exist along the proposed distribution line alignments. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

Minimal permanent conflicts are expected with existing agricultural zoning (resulting in a **less-than-significant impact relative to zoning**) or Williamson Act contracts from distribution line operation and maintenance because the distribution line poles would require a very small amount of land along the entire distribution line alignments, permanently affecting up to 16 parcels of land that have Williamson Act contracts. Due to the potential conflicts, this is considered a **significant impact relative to Williamson Act contracts**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Electrical Distribution Lines would have no permanent impact on land designated Agriculture Preserve in Colusa County, except at the individual pole locations, which would comprise a very small amount of land. This would result in minimal zoning conflict, and would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

The alignments of the Electrical Distribution Lines do not have forest land, so no conversion of forest land to non-forest use would occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Electrical Distribution Lines would not permanently change the existing environment of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local

Potential Farmland to another land use, except at the individual pole locations, which would comprise a very small amount of land. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Table 20-12 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing and maintaining the Alternative A Project Buffer.

Table 20-12
Project Buffer – Alternative A
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Number of Potentially Affected Parcels		
Glenn County	0	10
Colusa County	0	102
Total	**0**	**112**
Acreage of Potentially Affected Parcels		
Glenn County	0	1,872
Colusa County	0	9,977
Total	**0**	**11,849**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)		1,607
Foothill Agricultural/Forestry (144-acre minimum)		256
Colusa County		
Agriculture Preserve		9,391
Exclusive Agriculture		532
Foothill Agricultural/Forestry (144-acre minimum)		5
Floodway		10
N/A		48
Total	**0**	**11,849**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland		277
Grazing Land		1,584
Other Land		1
Colusa County		
Prime Farmland		284
Unique Farmland		7
Farmland of Local Importance		9,593
Water		3
Other Land		100
Total	**0**	**11,849**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	8
Colusa County	0	73
Total	**0**	**81**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	1,611
Colusa County	0	8,710
Total	**0**	**10,321**

Table 20-12
Project Buffer – Alternative A
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Number of Potentially Affected Parcels with WRP Easements	0	0
Number of Potentially Affected Acres with WRP Easements	0	0

*All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

Notes:
FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect

Refer to the **Impact Land-2** discussion for the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge. That discussion is also applicable to the Project Buffer because the Project Buffer would be located in both Glenn and Colusa counties.

Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and General Plan Designated Land Uses at and Adjacent to the Proposed Project Facilities

The Project Buffer would serve to buffer the Project facilities and activities from adjacent and surrounding land uses. The boundary of the Project Buffer would be fenced, using fencing materials that are similar to what is currently used in Glenn and Colusa counties for ranches. The lands within the Project Buffer would be managed as open space, which would be compatible with the existing and General Plan land uses that are adjacent to the Project facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Resources Agency, to Non-Agricultural Use

The Project Buffer would include 284 acres of Prime Farmland and 7 acres of Unique Farmland. It would be managed as open space. The land is zoned for agricultural purposes, but may be used for grazing or open space, in addition to being actively cropped. The change from an actively cropped agricultural land use to grazing or open space would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the Permanent Conversion of Lands that have a Williamson Act Contract

The Project Buffer would conflict with the zoning of land in Glenn County that is currently zoned as Agricultural Preserve and Foothill Agriculture/Forestry; and Agriculture Preserve, Exclusive Agriculture, Foothill Agriculture/Forestry, and Floodway in Colusa County. The permanent conflict from Project operation and maintenance would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, 81 parcels of land that have Williamson Act contracts would be permanently affected by the Project Buffer, which would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land (as Defined in Public Resources Code Section 12220(g)), Timberland (as Defined by Public Resources Code Section 4526), or Timberland Zoned Timberland Production (as Defined by Government Code Section 51104(g))

The Project Buffer encompasses lands in both Glenn and Colusa counties that are zoned for forest land and/or timberland; specifically, lands zoned as Foothill Agricultural/Forestry and Agricultural Preserve in Glenn County, and Foothill Agricultural/Forestry and Agriculture Preserve in Colusa County. This would result in a zoning conflict, and would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use

Refer to the **Impact Land-6** discussion. Due to the land being zoned for forest land and/or timberland, this is considered a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Land-8: Other Changes in the Existing Environment Which, due to Their Location or Nature, Could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or Permanent Conversion of Forest Land to Non-Forest Use

The Project Buffer Line would permanently change the existing environment of lands designated pursuant to the FMMP as Prime Farmland, Unique Farmland, Farmland of Local Importance, and Local Potential Farmland (acreages are presented in Table 20-12). The Project Buffer would also change the existing environment of lands zoned as Foothill Agriculture/Forestry. These changes would result in a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

20.3.6.4 Summary of Alternative A Land Use Impacts

Table 20-13 provides a summary of the number of potentially affected parcels, the acreage of those parcels, the zoning designations, the number of parcels and acreage of parcels with Williamson Act contracts, and the number of parcels and acreage of parcels with WRP easements for Alternative A.

Table 20-13
Summary of Land Use Impacts – Alternative A

	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
Project Facility	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Desig.**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge	149	137	13,464	12,464	AP1 AP2 EA FA-F N/A DU	13,464[d]	1,592 10,535 33 189 115 0	86	74	11,892	10,892	0	0	0	0
Recreation Areas	15	15	1,170	1,170	AP1 AP2	293 877	293 877	14	14	1,121	1,121	0	0	0	0
Road Relocations and TRR Pipeline Road	57	52	885	287	AP1 AP2 N/A	199 668 18	70 206 11	52	48	843	267	0	0	0	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0[e]	7	0[e]	89	AP2	0[e]	89	0[e]	6	0[e]	79	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	14	0[e]	348	AP2 EA	0[e] 0[e]	92 256	0[e]	3	0[e]	5	0	0	0	0
GCID Canal Facilities Modifications	0	3	5	1	NL IA DU	5[d]	1 0 0	0	0	0	0	0	0	0	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0[e]	9	0[e]	195	EA N/A	0[e] 0[e]	194 1	0[e]	0	0[e]	0	0	0	0	0
Delevan Pipeline and TRR Pipeline	64	0	2,058	0	EA LHI N/A	2,015 19 24	0 0 0	11	0	425	0	1[c]	0	5	0
Delevan Transmission Line	12	39	71	3	AP2 EA DU	31 40 0	3	7	11	54	3	1[c]	0	2	0
Delevan Pipeline Intake Facilities	0[e]	2	0[e]	19	EA F	0[e] 0[e]	15 4	0	0	0	0	0	0	0	0
Electrical Distribution Lines	16	16	27	0	AP2	27	0	16	16	27	0	0	0	0	0
Project Buffer	0	112	0	11,849	AP1 AP2 EA F FA-F N/A	0	1,607 9,391 532 10 261 48	0	81	0	10,321	0	0	0	0
TOTAL	**274[f]**	**209[f]**	**17,680**	**26,425**		**17,680**	**26,425**	**133[f]**	**113[f]**	**14,362**	**22,688**	**1[c]**	**0**	**7**	**0**

Table 20-13
Summary of Land Use Impacts – Alternative A

	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
Project Facility	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Desig.	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is one parcel total with a WRP easement that would be affected.

[d]The subtotals by designations of acreages of temporary impacts cannot be determined because it is unknown which parcels would comprise the complete construction disturbance area.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]The parcel totals are the count of distinct parcels across all Project facility groupings considered in the analysis (i.e. the total count does not represent the sum of column, as one parcel could be affected by several facilities). Therefore, these totals assume the worst case impact.

Notes:

Desig. = Designation
Perm. = Permanent
Temp. = Temporary
WRP = Wetland Reserve Program

Zoning Designations:

AP1 = Agricultural Preserve (Glenn County)
AP2 = Agriculture Preserve (Colusa County)
DU = Designation Undetermined
EA = Exclusive Agriculture
F = Floodway
FA-F = Foothill Agricultural/Forestry
IA = Intensive Agriculture
LHI = Light or Heavy Industrial
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
NL = No Information Available

Table 20-14 provides a summary of impacts to FMMP-designated land for Alternative A.

Table 20-14
Summary of Impacts to FMMP-Designated Land – Alternative A

Project Facility	Acreage																	
	Temporary Impact to FMMP-Designated Land[a]									Permanent Impact to FMMP-Designated Land[b]								
	D	G	L	LP	P	S	U	X	DU	D	G	L	LP	P	S	U	W	X	DU
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge[c]	0	[c]	[c]	[c]	0	0	0	[c]	13,464[c]	0	727	10,582	1,042	0	0	0	0	113	0
Recreation Areas	0	232	811	61	0	0	0	66	0	0	232	811	61	0	0	0	0	66	0
Road Relocations and TRR Pipeline Road	0	128	669	87	0	0	0	0[d]	0	0	51	206	30	0	0	0	0	0[d]	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	89	0	0	0	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	233	0	115	0	0	0	0	0
GCID Canal Facilities Modifications	1	0	0[d]	0	0[d]	0[d]	0	3	0	0[d]	0	0[d]	0	0[d]	0[d]	0	0	1	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0	0	0[e]	0	0[e]	0	0	0[e]	0	0	0	1	0	194	0	0	0	0[d]	0
Delevan Pipeline and TRR Pipeline	0	0	46	0	957	0	1,001	54	0	0	0	0	0	0	0	0	0	0	0
Delevan Transmission Line[f]	0	0	70	0	2	0	0	0	0	0	0	[f]	0	[f]	0	0	0	0	3[f]
Delevan Pipeline Intake Facilities	0	0	0	0	0[e]	0	0	0[e]	0	0	0	0	0	13	0	0	0	6	0
Electrical Distribution Lines	0	0	26	0	0	0	0	0[d]	0	0	0	0	0	0	0	0	0	0	0
Project Buffer	0	0	0	0	0	0	0	0	0	0	1,584	9,593	277	284	0	7	3	101	0
TOTAL	**1**	**360[c]**	**1,622[c]**	**148[c]**	**960**	**0[d]**	**1,001**	**124[c]**	**13,464[c]**	**0**	**2,594**	**21,515[f]**	**1,410**	**606[f]**	**0[d]**	**7**	**3**	**287**	**3[f]**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-13.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-13.

[c]For the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge Project facilities grouping, a total of 13,464 acres would be temporarily affected during Project construction. The acreage cannot be assigned to a specific FMMP category because the 1,000 acres of construction disturbance area that would be located outside of the Sites Reservoir footprint have not been defined.

[d]There is less than one acre in these categories, but more than zero.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]A total of 2.5 acres would be permanently disturbed from transmission line poles, but due to pole locations being currently unknown, the affected FMMP category cannot currently be determined. Therefore, 2.5 acres of land more than the total listed in Long-Term Impacts would be permanently affected.

Notes:
FMMP = Farmland Mapping and Monitoring Program

FMMP Designations:

D = Urban and Built-up Land
DU = Designation Undetermined
G = Grazing Land
L = Farmland of Local Importance
LP = Local Potential Farmland
P = Prime Farmland
S = Farmland of Statewide Importance
U = Unique Farmland
W = Water
X = Other Land

20.3.7 Impacts Associated with Alternative B

20.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to established communities (**Impact Land-1**); potential conflicts with land use plans, policies or regulations (**Impact Land-2**); compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); effects on FMMP designated land uses (**Impact Land-4**); consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land-5**); consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**); would be the same as described for Alternative A for the Extended Study Area.

20.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to established communities (**Impact Land-1**); potential conflicts with land use plans, policies or regulations (**Impact Land-2**); compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); effects on FMMP designated land uses (**Impact Land-4**); consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land-5**); consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**); would be the same as described for Alternative A for the Secondary Study Area.

20.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to land use:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road

- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprint or construction disturbance area of Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge; the Road Relocations and TRR Pipeline Road; the Delevan Transmission Line; and the Electrical Distribution Lines would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities would differ between the alternatives, the acreage of land within the Project Buffer would also differ. The acreage summaries of the potential temporary and permanent land use changes associated with Alternative B are presented in Tables 20-15 through 20-20.

These differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on established communities (**Impact Land-1**); its potential conflicts with land use plans, policies or regulations (**Impact Land-2**); its compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); its effects on FMMP designated land uses (**Impact Land-4**); its consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land-5);** its consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**) as described for Alternative A.

Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge

Table 20-15 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing and maintaining the Alternative B Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge.

Table 20-15
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge – Alternative B Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	11	11
Colusa County	136	136
Undetermined[c]	12	0
Total	**159**	**147**
Acreage of Potentially Affected Parcels		
Glenn County	2,188	2,188
Colusa County	12,226	12,226
Undetermined[c]	1,000	0
Total	**15,414**	**14,414**

Table 20-15
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge – Alternative B Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)		1,907
Foothill Agriculture/Forestry (144-acre minimum)		258
Colusa County		
Agriculture Preserve		12,079
Exclusive Agriculture		33
Foothill Agriculture/Forestry (144-acre minimum)		9
N/A		128
Total	**15,414[d]**	**14,414**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland		1,145
Grazing Land		1,015
Other Land		6
Colusa County		
Farmland of Local Importance		12,120
Other Land		128
Total	**15,414[d]**	**14,414**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	9	9
Colusa County	74	74
Undetermined[c]	12	0
Total	**95**	**83**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County		1,921
Colusa County		10,729
Total	**13,650[d]**	**12,650**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]Undetermined values represent construction disturbance areas for which locations have not been determined. Reported undetermined values are the maximum number of additional parcels or acreages that would be temporarily affected.

[d]The temporarily affected acreages by zoning and FMMP designations and Williamson Act contracts cannot be determined because it is unknown which parcels would comprise the 1,000-acre construction disturbance area.

Notes:
FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

Road Relocations and Terminal Regulating Reservoir Pipeline Road

Table 20-16 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative B Road Relocations and TRR Pipeline Road.

Table 20-16
Road Relocations and Terminal Regulating Reservoir Pipeline Road – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a,c]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Glenn County	11	13
Colusa County	42[d]	38
Total	**53**	**51**
Acreage of Potentially Affected Parcels		
Glenn County	222	82
Colusa County	671	207
Total	**893**	**289**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)	136	55
Agricultural Preserve (72-acre minimum)	68	15
N/A	17	11
Colusa County		
Agriculture Preserve	670	208
N/A	2	0[c]
Total	**893**	**289**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland	83	29
Grazing Land	137	53
Other Land	0[c]	0[c]
Colusa County		
Farmland of Local Importance	672	208
Other Land	0[c]	0
Total	**893**	**294**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	10	12
Colusa County	38	35
Total	**48**	**47**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	201	70
Colusa County	650	200
Total	**851**	**270**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

Table 20-16
Road Relocations and Terminal Regulating Reservoir Pipeline Road – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a,c]	Permanent Impacts[b]

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is less than one acre in these categories, but more than zero.

[d]Differences between temporary and long-term acreages for these categories are due to the TRR Pipeline Road being located within the Delevan and TRR Pipeline disturbance area, thus having no construction disturbance area of its own. This also applies to the differences in the number of parcels affected.

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Delevan Transmission Line

Table 20-17 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative B Delevan Transmission Line.

Table 20-17
Delevan Transmission Line – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	8	8[c]
Acreage of Potentially Affected Parcels		
Colusa County	54	1[c]
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	31	
Exclusive Agriculture	23	
Total	**54**	**1[c,d]**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Farmland of Local Importance	54	
Total	**54**	**1[c,d]**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	6	**6**[c]
Total	**6**	**6**[c]
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	49	1[c]
Total	**49**	**1[c]**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**

Table 20-17
Delevan Transmission Line – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]Because the placement of the transmission line towers is currently not known, each parcel along the alignment would be potentially affected, resulting in 0.5 acres actual permanent disturbance.

[d]There is less than one acre in these categories, but more than zero.

Notes:
FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Delevan Pipeline Discharge Facility

Table 20-18 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative B Delevan Pipeline Discharge Facility.

Table 20-18
Delevan Pipeline Discharge Facility – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	0[c]	3
Acreage of Potentially Affected Parcels		
Colusa County	0[c]	8
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Exclusive Agriculture	0[c]	5
Floodway	0[c]	3
Total	**0[c]**	**8**
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Prime Farmland	0[c]	4
Other Land	0[c]	3
Total	**0[c]**	**8**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0	0
Total	**0**	**0**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	0	0
Total	**0**	**0**

Table 20-18
Delevan Pipeline Discharge Facility – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]All construction disturbance area numbers for this Project facility grouping are zero because the construction disturbance area for this grouping would be within the adjacent Delevan Pipeline construction disturbance area. It is noted that the actual construction disturbance area for this grouping would be 6.3 acres within the pipeline construction disturbance area (it would be smaller than the permanent facility footprint because of an overlap between the Delevan Pipeline construction disturbance area and Delevan Pipeline Intake Facilities permanent facility footprint).

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Electrical Distribution Lines

Table 20-19 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of constructing, operating, and maintaining the Alternative B Electrical Distribution Lines.

Table 20-19
Electrical Distribution Lines – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels		
Colusa County	14	14[d]
Acreage of Potentially Affected Parcels		
Colusa County	25	0[c]
Zoning Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Agriculture Preserve	25	
Total	**25**	**0**[c]
FMMP Designation of Potentially Affected Parcels (Acres)		
Colusa County		
Farmland of Local Importance	25	
Other Land	0[c]	
Total	**25**	**0**[c]
Number of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	14	14[d]
Total	**14**	**14**[d]
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Colusa County	25	0[c]
Total	**25**	**0**[c]

Table 20-19
Electrical Distribution Lines – Alternative B
Land Use Summary

Descriptor	Temporary Impacts[a]	Permanent Impacts[b]
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is less than one acre in this category, but more than zero.

[d]Because the placement of the electrical distribution lines is currently not known, each parcel along the alignment would be potentially affected.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

Project Buffer

Table 20-20 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of the Alternative B Project Buffer.

Table 20-20
Project Buffer – Alternative B
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Number of Potentially Affected Parcels		
Glenn County	0	10
Colusa County	0	98
Total	**0**	**108**
Acreage of Potentially Affected Parcels		
Glenn County	0	1,479
Colusa County	0	8,430
Total	**0**	**9,909**
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)		1,292
Foothill Agricultural/Forestry (144-acre minimum)		180
Colusa County		
Agriculture Preserve		7,846
Exclusive Agriculture		542
Foothill Agricultural/Forestry (144-acre minimum)		3
Floodway		12
N/A		34
Total	**0**	**9,909**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland		179
Grazing Land		1,292
Other Land		1

Table 20-20
Project Buffer – Alternative B
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Colusa County		
Prime Farmland		293
Unique Farmland		7
Farmland of Local Importance		8,052
Water		3
Other Land		82
Total	**0**	**9,909**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	8
Colusa County	0	69
Total	**0**	**77**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	1,296
Colusa County	0	7,265
Total	**0**	**8,561**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

*All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

Notes:
FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

20.3.7.4 Summary of Alternative B Land Use Impacts

Table 20-21 provides a summary of the number of potentially affected parcels, the acreage of those parcels, the zoning designations, the number of parcels and acreage of parcels with Williamson Act contracts, and the number of parcels and acreage of parcels with WRP easements for Alternative B.

Table 20-21
Summary of Land Use Impacts – Alternative B

	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
Project Facility	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Desig.**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge	159	147	15,414	14,414	AP1 AP2 EA FA-F N/A DU	15,414[d]	1,907 12,079 33 267 128 0	95	83	13,650	12,650	0	0	0	0
Recreation Areas	15	15	1,170	1,170	AP1 AP2	293 877	293 877	14	14	1,121	1,121	0	0	0	0
Road Relocations and TRR Pipeline Road	53	51	893	289	AP1 AP2 N/A	204 670 19	70 208 11	48	47	851	270	0	0	0	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0[e]	7	0[e]	89	AP2	0[e]	89	0[e]	6	0[e]	79	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	14	0[e]	348	AP2 EA	0[e] 0[e]	92 256	0[e]	3	0[e]	5	0	0	0	0
GCID Canal Facilities Modifications	0	3	5	1	NL IA DU	5[d]	1 0 0	0	0	0	0	0	0	0	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0[e]	9	0[e]	195	EA N/A	0[e] 0[e]	194 1	0[e]	0	0[e]	0	0	0	0	0
Delevan Pipeline and TRR Pipeline	64	0	2,075[g]	0	EA LHI N/A	2,032[g] 19 24	0 0 0	11	0	430[g]	0	1[c]	0	5	0
Delevan Transmission Line	8	8	54	1	AP2 EA DU	31 23 0	1	6	6	49	1	0	0	0	0
Delevan Pipeline Discharge Facility	0[e]	3	0[e]	8	EA F	0[e] 0[e]	5 3	0	0	0	0	0	0	0	0
Electrical Distribution Lines	14	14	25	0	AP2	25	0	14	14	25	0	0	0	0	0
Project Buffer	0	108	0	9,909	AP1 AP2 EA F FA-F N/A		1,292 7,846 542 12 183 34	0	77	0	8,561	0	0	0	0
TOTAL	**277[f]**	**210[f]**	**19,637**	**26,424**		**19,637**	**26,424**	**135[f]**	**113[f]**	**16,126**	**22,687**	**1**	**0**	**5**	**0**

Table 20-21
Summary of Land Use Impacts – Alternative B

Project Facility	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Desig.	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]	Temp.[a]	Perm.[b]

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is one parcel total with a WRP easement that would be affected.

[d]The subtotals by designations of acreages of temporary impacts cannot be determined because it is unknown which parcels would comprise the complete construction disturbance area.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]The parcel totals are the count of distinct parcels across all Project facility groupings considered in the analysis (i.e. the total count does not represent the sum of column, as one parcel could be affected by several facilities). Therefore, these totals assume the worst case impact.

[g]The Delevan Pipeline and TRR Pipeline facility grouping is the same for all three alternatives. The acreages of temporary impacts are slightly different due differences in the boundaries associated with other Project facility groupings and the method applied to reduce the double counting of acreages.

Notes:

Desig. = Designation
Perm. = Permanent
Temp. = Temporary
WRP = Wetland Reserve Program

Zoning Designations:

AP1 = Agricultural Preserve (Glenn County)
AP2 = Agriculture Preserve (Colusa County)
DU = Designation Undetermined
EA = Exclusive Agriculture
F = Floodway
FA-F = Foothill Agricultural/Forestry
IA = Intensive Agriculture
LHI = Light or Heavy Industrial
NL = No Information Available
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)

Table 20-22 provides a summary of impacts to FMMP-designated land for Alternative B.

Table 20-22
Summary of Impacts to FMMP-Designated Land – Alternative B

Project Facility	Acreage																		
	Temporary Impact to FMMP-Designated Land[a]									Permanent Impact to FMMP-Designated Land[b]									
	D	G	L	LP	P	S	U	X	DU	D	G	L	LP	P	S	U	W	X	DU
Sites Reservoir Inundation Area. Sites Reservoir Dams, and South Bridge[c]	0	[c]	[c]	[c]	0	0	0	[c]	15,414[c]	0	1,015	12,120	1,145	0	0	0	0	134	0
Recreation Areas	0	232	811	61	0	0	0	66	0	0	232	811	61	0	0	0	0	66	0
Road Relocations and TRR Pipeline Road	0	137	672	83	0	0	0	0[d]	0	0	53	208	29	0	0	0[d]	0	0[d]	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	89	0	0	0	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	233	0	115	0	0	0	0	0
GCID Canal Facilities Modifications	1	0	0[d]	0	0[d]	0[d]	0	3	0	0[d]	0	0[d]	0	0[d]	0[d]	0	0	1	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0	0	0[e]	0	0[e]	0	0	0[e]	0	0	0	1	0	194	0	0	0	0[d]	0
Delevan Pipeline and TRR Pipeline	0	0	46	0	964	0	1,011	54	0	0	0	0	0	0	0	0	0	0	0
Delevan Transmission Line[f]	0	0	54	0	0	0	0	0	0	0	0	[f]	0	0	0	0	0	0	1[f]
Delevan Pipeline Discharge Facility	0	0	0	0	0[e]	0	0	0[e]	0	0	0	0	0	4	0	0	0	3	0
Electrical Distribution Lines	0	0.	25	0	0	0	0	0[d]	0	0	0	0	0	0	0	0	0	0	0
Project Buffer	0	0	0	0	0	0	0	0	0	0	1,301	8,052	179	293	0	7	3	83	0
TOTAL	**1**	**369[c]**	**1,608[c]**	**144[c]**	**965**	**0[d]**	**1,011**	**124[c]**	**15,414[c]**	**0[d]**	**2,601**	**21,514[f]**	**1,414**	**607**	**0[d]**	**7**	**3**	**286**	**1[f]**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-21.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-21.

[c]For the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge Project facilities grouping, a total of 15,414 acres would be temporarily affected during Project construction. The acreage cannot be assigned to a specific FMMP category because the 1,000 acres of construction disturbance area that would be located outside of the Sites Reservoir footprint have not been defined.

[d]There is less than one acre in these categories, but more than zero.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]A total of 0.5 acre would be permanently disturbed from transmission line poles, but due to pole locations being currently unknown, the affected FMMP category cannot currently be determined. Therefore, 0.5 acre of land more than the total listed in Long-Term Impacts would be permanently affected.

Notes:
FMMP = Farmland Mapping and Monitoring Program

FMMP Designations:

D = Urban and Built-up Land
DU = Designation Undetermined
G = Grazing Land
L = Farmland of Local Importance
LP = Local Potential Farmland
P = Prime Farmland
S = Farmland of Statewide Importance
U = Unique Farmland
W = Water
X = Other Land

Table 20-23 provides a summary comparison of land use impacts for Alternative B and Alternative A.

Table 20-23
Land Use Summary: Alternative B Compared to Alternative A[a]

Descriptor	Alternative B		Alternative A	
	Temporary Impacts	Permanent Impacts	Temporary Impacts	Permanent Impacts
Number of Potentially Affected Parcels	277	210	274	209
Acreage of Potentially Affected Parcels	19,637	26,424	17,680	26,425
Zoning Designation of Potentially Affected Parcels (Acres)				
Agricultural Preserve	2,100	24,753	2,095	24,752
Exclusive Agriculture	2,055	1,030	2,055	1,030
Foothill Agriculture/Forestry	0	450	0	450
Floodway	0	15	0	14
Intensive Agriculture	0	0	0	0
Light or Heavy Industrial	19	0	19	0
N/A	43	174	42	175
No Information Available	0	1	0	1
Designation Undetermined	15,419	1	13,469	3
Total	**19,637**	**26,424**	**17,680**	**26,425**
FMMP Designation of Potentially Affected Parcels (Acres)				
Urban and Built-up Land	1	0[c]	1	0
Grazing Land	369	2,601	360	2,594
Farmland of Local Importance	1,608	21,514[b]	1,622	21,515[b]
Local Potential Farmland	144	1,414	148	1,410
Prime Farmland	965	607	960	606[b]
Farmland of Statewide Importance	0[c]	0[c]	0[c]	0[c]
Unique Farmland	1,011	7	1,001	7
Water	0	3	0	3
Other Land	124	286	124	287
Designation Undetermined	15,414	1[b]	13,464	3[b]
Total	**19,637**	**26,424**	**17,680**	**26,425**
Number of Potentially Affected Parcels with Williamson Act Contracts	135	113	133	113
Acreage of Potentially Affected Parcels with Williamson Act Contracts	16,126	22,687	14,362	22,688
Number of Potentially Affected Parcels with WRP Easements	1	0	1	0
Number of Potentially Affected Acres with WRP Easements	5	0	7	0

[a]Totals may not match due to the rounding of individual acreages that comprise the totals.

[b]A total of 2.5 acres under Alternative A and 0.5 acres under Alternative B would be permanently disturbed from transmission line poles, but due to pole locations being currently unknown, the affected FMMP category cannot currently be determined. Therefore, 2.5 acres under Alternative A and 0.5 acres under Alternative B of land more than the total listed in Long-Term Impacts would be permanently affected.

[C]There is less than one acre in these categories, but more than zero.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

20.3.8 Impacts Associated with Alternative C

20.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to established communities (**Impact Land-1**); potential conflicts with land use plans, policies or regulations (**Impact Land-2**); compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); effects on FMMP designated land uses (**Impact Land-4**); consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land 5);** consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**); would be the same as described for Alternative A for the Extended Study Area.

20.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to established communities (**Impact Land-1**); potential conflicts with land use plans, policies or regulations (**Impact Land-2**); compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); effects on FMMP designated land uses (**Impact Land-4**); consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land-5**); consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**); would be the same as described for Alternative A for the Secondary Study Area.

20.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to land use:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road

- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to land use as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge; the Road Relocations and TRR Pipeline Road; and the Electrical Distribution Lines is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to land use as described for Alternative B.

Provided below in Table 20-24 is a summary of the potential temporary and permanent land use changes that are expected to occur as a result of the Project Buffer. The boundary of the Project Buffer would be the same for all alternatives, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on established communities (**Impact Land-1**); potential conflicts with land use plans, policies or regulations (**Impact Land-2**); compatibility with existing land uses adjacent to proposed Project facilities (**Impact Land-3**); effects on FMMP designated land uses (**Impact Land-4**); consistency with existing zoning, or effects on parcels that have Williamson Act contracts (**Impact Land-5);** consistency with forest land zoning (**Impact Land-6**) or effects on forest land (**Impact Land-7**); and other changes in the environment that could convert farmland or forest land to other uses (**Impact Land-8**) as described for Alternative A.

Project Buffer

Table 20-24 provides a summary of the potential temporary and permanent land use changes that are expected to occur as a result of the Alternative C Project Buffer.

Table 20-24
Project Buffer – Alternative C
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Number of Potentially Affected Parcels		
Glenn County	0	10
Colusa County	0	98
Total	**0**	**108**
Acreage of Potentially Affected Parcels		
Glenn County	0	1,479
Colusa County	0	8,418
Total	**0**	**9,897**

Table 20-24
Project Buffer – Alternative C
Land Use Summary

Descriptor	Temporary Impacts	Permanent Impacts*
Zoning Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Agricultural Preserve (144-acre minimum)		1,292
Foothill Agricultural/Forestry (144-acre minimum)		180
Colusa County		
Agriculture Preserve		7,846
Exclusive Agriculture		532
Foothill Agricultural/Forestry (144-acre minimum)		3
Floodway		10
N/A		34
Total	**0**	**9,897**
FMMP Designation of Potentially Affected Parcels (Acres)		
Glenn County		
Local Potential Farmland		179
Grazing Land		1,292
Other Land		1
Colusa County		
Prime Farmland		284
Unique Farmland		7
Farmland of Local Importance		8,052
Water		3
Other Land		79
Total	**0**	**9,897**
Number of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	8
Colusa County	0	69
Total	**0**	**77**
Acreage of Potentially Affected Parcels with Williamson Act Contracts		
Glenn County	0	1,296
Colusa County	0	7,265
Total	**0**	**8,561**
Number of Potentially Affected Parcels with WRP Easements	**0**	**0**
Number of Potentially Affected Acres with WRP Easements	**0**	**0**

*All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

Notes:

FMMP = Farmland Mapping and Monitoring Program
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County)
WRP = Wetland Reserve Program

20.3.8.4 Summary of Alternative C Land Use Impacts

Table 20-25 provides a summary of the number of potentially affected parcels, the acreage of those parcels, the zoning designations, the number of parcels and acreage of parcels with Williamson Act contracts, and the number of parcels and acreage of parcels with WRP easements for Alternative C.

Table 20-25
Summary of Land Use Impacts – Alternative C

	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
Project Facility	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Desig.**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**
Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge	159	147	15,414	14,414	AP1 AP2 EA FA-F N/A DU	15,414[d]	1,907 12,079 33 267 128 0	95	83	13,650	12,650	0	0	0	0
Recreation Areas	15	15	1,170	1,170	AP1 AP2	293 877	293 877	14	14	1,121	1,121	0	0	0	0
Road Relocations and TRR Pipeline Road	53	51	893	289	AP1 AP2 N/A	204 670 19	70 208 11	48	47	851	270	0	0	0	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0[e]	7	0[e]	89	AP2	0[e]	89	0[e]	6	0[e]	79	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	14	0[e]	348	AP2 EA	0[e] 0[e]	92 256	0[e]	3	0[e]	5	0	0	0	0
GCID Canal Facilities Modifications	0	3	5	1	NL IA DU	5[d]	1 0 0	0	0	0	0	0	0	0	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0[e]	9	0[e]	195	EA N/A	0[e] 0[e]	194 1	0[e]	0	0[e]	0	0	0	0	0
Delevan Pipeline and TRR Pipeline	64	0	2,058	0	EA LHI N/A	2,015 19 24	0 0 0	11	0	425	0	1[c]	0	5	0
Delevan Transmission Line	12	39	71	3	AP2 EA DU	31 40 0	3	7	11	54	3	1[c]	0	2	0
Delevan Pipeline Intake Facilities	0[e]	2	0[e]	19	EA F	0[e] 0[e]	15 4	0	0	0	0	0	0	0	0
Electrical Distribution Lines	14	14	25	0	AP2	25	0	14	14	25	0	0	0	0	0
Project Buffer	0	108	0	9,897	AP1 AP2 EA F FA-F N/A		1,292 7,846 532 10 183 34	0	77	0	8,561	0	0	0	0
TOTAL	**278[f]**	**209[f]**	**19,636**	**26,425**		**19,636**	**26,425**	**136[f]**	**113[f]**	**16,126**	**22,689**	**1**	**0**	**7**	**0**

Table 20-25
Summary of Land Use Impacts – Alternative C

	No. of Potentially Affected Parcels		Acreage of Potentially Affected Parcels		Zoning Designation of Potentially Affected Acreages			No. of Potentially Affected Parcels with Williamson Act Contracts		No. of Potentially Affected Acres with Williamson Act Contracts		No. of Potentially Affected Parcels with WRP Easements		No. of Potentially Affected Acres with WRP Easements	
Project Facility	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Desig.**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**	**Temp.[a]**	**Perm.[b]**

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed.

[c]There is one parcel total with a WRP easement that would be affected.

[d]The subtotals by designations of acreages of temporary impacts cannot be determined because it is unknown which parcels would comprise the complete construction disturbance area.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]The parcel totals are the count of distinct parcels across all Project facility groupings considered in the analysis (i.e. the total count does not represent the sum of column, as one parcel could be affected by several facilities). Therefore, these totals assume the worst case impact.

Notes:

Desig. = Designation
Perm. = Permanent
Temp. = Temporary
WRP = Wetland Reserve Program

Zoning Designations:

AP1 = Agricultural Preserve (Glenn County)
AP2 = Agriculture Preserve (Colusa County)
DU = Designation Undetermined
EA = Exclusive Agriculture
F = Floodway
FA-F = Foothill Agricultural/Forestry
IA = Intensive Agriculture
LHI = Light or Heavy Industrial
N/A = There is no County zoning designation (e.g., the area is located in a roadway corridor that is not officially zoned by the County).
NL = No Information Available

Table 20-26 provides a summary of impacts to FMMP-designated land for Alternative C.

Table 20-26
Summary of Impacts to FMMP-Designated Land – Alternative C

	Acreage																	
	Temporary Impact to FMMP-Designated Land[a]									Permanent Impact to FMMP-Designated Land[b]								
Project Facility	**D**	**G**	**L**	**LP**	**P**	**S**	**U**	**X**	**DU**	**D**	**G**	**L**	**LP**	**P**	**S**	**U**	**W**	**X**	**DU**
Sites Reservoir Inundation Area. Sites Reservoir Dams, and South Bridge[c]	0	[c]	[c]	[c]	0	0	0	[c]	15,414[c]	0	1,015	12,120	1,145	0	0	0	0	134	0
Recreation Areas	0	232	811	61	0	0	0	66	0	0	232	811	61	0	0	0	0	66	0
Road Relocations and TRR Pipeline Road	0	137	672	83	0	0	0	0[d]	0	0	53	208	29	0	0	0[d]	0	0[d]	0
Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, and Asphalt Batch Plant	0	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	89	0	0	0	0	0	0	0
Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard	0[e]	0[e]	0[e]	0[e]	0[e]	0	0[e]	0[e]	0	0	0	233	0	115	0	0	0	0	0
GCID Canal Facilities Modifications	1	0	0[d]	0	0[d]	0[d]	0	3	0	0[d]	0	0[d]	0	0[d]	0[d]	0	0	1	0
TRR, TRR Pumping/Generating Plant, GCID Canal Connection to the TRR, TRR to Funks Creek Pipeline, TRR to Funks Creek Outlet, and TRR Electrical Switchyard	0	0	0[e]	0	0[e]	0	0	0[e]	0	0	0	1	0	194	0	0	0	0[d]	0
Delevan Pipeline and TRR Pipeline	0	0	46	0	957	0	1,001	54	0	0	0	0	0	0	0	0	0	0	0
Delevan Transmission Line[f]	0	0	70	0	2	0	0	0	0	0	0	[f]	0	[f]	0	0	0	0	3[f]
Delevan Pipeline Intake Facilities	0	0	0	0	0[e]	0	0	0[e]	0	0	0	0	0	13	0	0	0	6	0
Electrical Distribution Lines	0	0.	25	0	0	0	0	0[d]	0	0	0	0	0	0	0	0	0	0	0
Project Buffer	0	0	0	0	0	0	0	0	0	0	1,301	8,052	179	284	0	7	3	80	0
TOTAL	**1**	**369[c]**	**1,624[c]**	**144[c]**	**960**	**0[d]**	**1,001**	**123[c]**	**15,414[c]**	**0[d]**	**2,601**	**21,514[f]**	**1,414**	**606[f]**	**0[d]**	**7**	**3**	**287**	**3[f]**

Table 20-26
Summary of Impacts to FMMP-Designated Land – Alternative C

Project Facility	Acreage																		
	Temporary Impact to FMMP-Designated Land[a]									Permanent Impact to FMMP-Designated Land[b]									
	D	G	L	LP	P	S	U	X	DU	D	G	L	LP	P	S	U	W	X	DU

[a]Acreage of temporary impacts consist of the Project facility footprints plus the associated construction disturbance area. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-25.

[b]Acreage of permanent impacts consist of the Project facility footprints. All numbers have been rounded to the acre. Due to rounding of all acreages listed in this table, individual acreages may not add up to the total acreages listed in this table or Table 20-25.

[c]For the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge Project facilities grouping, a total of 15,414 acres would be temporarily affected during Project construction. The acreage cannot be assigned to a specific FMMP category because the 1,000 acres of construction disturbance area that would be located outside of the Sites Reservoir footprint have not been defined.

[d]There is less than one acre in these categories, but more than zero.

[e]The numbers for parcels and acreages of temporary impacts for this Project facility grouping are zero because they are within and already accounted for under the numbers for parcels and acreages of temporary impacts for another Project facility grouping.

[f]A total of 2.5 acre would be permanently disturbed from transmission line poles, but due to pole locations being currently unknown, the affected FMMP category cannot currently be determined. Therefore, 2.5 acre of land more than the total listed in Long-Term Impacts would be permanently affected.

Notes:
FMMP = Farmland Mapping and Monitoring Program

FMMP Designations:
D = Urban and Built-up Land
G = Grazing Land
L = Farmland of Local Importance
LP = Local Potential Farmland
P = Prime Farmland
S = Farmland of Statewide Importance
U = Unique Farmland
W = Water
X = Other Land
DU = Designation Undetermined

Table 20-27 provides a summary comparison of land use impacts for Alternative C and Alternative A.

Table 20-27
Land Use Summary: Alternative C Compared to Alternative A[a]

Descriptor	Alternative C		Alternative A	
	Temporary Impacts	Permanent Impacts	Temporary Impacts	Permanent Impacts
Number of Potentially Affected Parcels	278	209	274	209
Acreage of Potentially Affected Parcels	19,636	26,425	17,680	26,425
Zoning Designation of Potentially Affected Parcels (Acres)				
Agricultural Preserve	2,100	24,753	2,095	24,752
Exclusive Agriculture	2,055	1,030	2,055	1,030
Foothill Agriculture/Forestry	0	450	0	450
Floodway	0	14	0	14
Intensive Agriculture	0	0	0	0
Light or Heavy Industrial	19	0	19	0
N/A	43	174	42	175
No Information Available	0	1	0	1
Designation Undetermined	15,419	3	13,469	3
Total	**19,636**	**26,425**	**17,680**	**26,425**
FMMP Designation of Potentially Affected Parcels (Acres)				
Urban and Built-up Land	1	0[c]	1	0
Grazing Land	369	2,601	360	2,594
Farmland of Local Importance	1,624	21,514[b]	1,622	21,515[b]
Local Potential Farmland	144	1,414	148	1,410
Prime Farmland	960	606[b]	960	606[b]
Farmland of Statewide Importance	0[c]	0[c]	0[c]	0[c]
Unique Farmland	1,001	7	1,001	7
Water	0	3	0	3
Other Land	123	287	124	287
Designation Undetermined	15,414	3[b]	13,464	3[b]
Total	**19,636**	**26,425**	**17,680**	**26,425**
Number of Potentially Affected Parcels with Williamson Act Contracts	136	113	133	113
Acreage of Potentially Affected Parcels with Williamson Act Contracts	16,126	22,689	14,362	22,688
Number of Potentially Affected Parcels with WRP Easements	1	0	1	0
Number of Potentially Affected Acres with WRP Easements	7	0	7	0

[a]Totals may not match due to the rounding of individual acreages that comprise the totals.

[b]A total of 2.5 acres would under Alternative A and C would be permanently disturbed from transmission line poles, but due to pole locations being currently unknown, the affected FMMP category cannot currently be determined. Therefore, 2.5 acres under Alternative A and C of land more than the total listed in Long-Term Impacts would be permanently affected.

[C]There is less than one acre in these categories, but more than zero.

Notes:

FMMP = Farmland Mapping and Monitoring Program
WRP = Wetland Reserve Program

20.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 20-28 for the impacts that have been identified as significant or potentially significant.

Table 20-28
Summary of Mitigation Measures for NODOS Project Impacts to Land Use

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Land-1: Physical Division of an Established Community	Sites Reservoir Inundation Area and Sites Reservoir Dams (construction, operation, and maintenance effects on the Town of Sites)	Significant	No feasible mitigation	Significant and Unavoidable
Impact Land-2: Conflict with an Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project Adopted for the Purpose of Avoiding or Mitigating an Environmental Effect	Sites Reservoir Inundation Area and Sites Reservoir Dams, Saddle Dam Recreation Area, Road Relocations, Project Buffer (construction, operation, and maintenance)	Significant in Glenn County	Mitigation Measure Land-2a: To the Extent Possible, Work with Glenn County to Encourage the County to Modify or Amend the Glenn County General Plan to Bring it into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
	Delevan Transmission Line, Delevan Pipeline (construction, operation, and maintenance)	Significant	Mitigation Measure Land-2b: Execute an Agreement with NRCS to Amend WRP Easement Contract and Conduct Post-Construction Wetland Restoration	Less than Significant
Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the **<u>Existing</u>** and General Plan Designated **<u>Land Uses</u>** at and Adjacent to Proposed Project Facilities	Delevan Pipeline, TRR Pipeline, Delevan Transmission Line, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility, Electrical Distribution Lines (construction)	Significant	Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant
	Sites Reservoir Inundation Area and Sites Reservoir Dams (construction effects on Sites Cemetery and the Rancheria Cemetery)	Significant	Mitigation Measure Cul-4a: Relocation of Known Cemeteries	Less than Significant
	Sites Reservoir Inundation Area (construction, operation, and maintenance effects on the Town of Sites)	Significant	Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable

Table 20-28
Summary of Mitigation Measures for NODOS Project Impacts to Land Use

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Land-3b: Execute an Agreement with Maxwell Irrigation District to Minimize and Avoid Short-Term and Long-Term Impacts to Existing Facilities and Operations	Less than Significant
Impact Land-3: Changes in Land Use as a Result of Implementing the Alternatives that are Considered to be Incompatible with the Existing and **General Plan Designated Land Uses** at and Adjacent to Proposed Project Facilities	Sites Reservoir Inundation Area and Sites Reservoir Dams; Recreation Areas; Road Relocations; South Bridge, and TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Asphalt Batch Plant; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; TRR; TRR Pumping/Generating Plant; GCID Canal Connection to the TRR; TRR Electrical Switchyard; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility (construction, operation, and maintenance)	Significant	Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
	Delevan Pipeline and TRR Pipeline, Delevan Transmission Line, Electrical Distribution Lines (construction)	Significant	Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Impact Land-4: Permanent Conversion of Prime Farmland, as Shown on the Maps Prepared Pursuant to the FMMP of the California Natural Resources Agency, Department of Conservation, to Non-Agricultural Use	Road Relocations, South Bridge, and TRR Pipeline Road (Colusa County); Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; TRR; TRR Pumping/Generating Plant; GCID Canal Connection to the TRR; TRR Electrical Switchyard; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility (operation and maintenance)	Significant	Mitigation Measure Land-4a: Enter into Agricultural Conservation Easements with Glenn and Colusa Counties	Less than Significant

Table 20-28
Summary of Mitigation Measures for NODOS Project Impacts to Land Use

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Land-5: **Permanent Conflict with Existing Zoning for Agricultural Use**, and/or the Permanent Conversion of Lands that have a Williamson Act Contract	Sites Reservoir Inundation Area and Sites Reservoir Dams; Recreation Areas; Road Relocations, South Bridge, and TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Asphalt Batch Plant; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; TRR; TRR Pumping/Generating Plant; GCID Canal Connection to the TRR; TRR Electrical Switchyard; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility; Project Buffer (operation and maintenance)	Significant	Mitigation Measure Land-5a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Zoning Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Impact Land-5: Permanent Conflict with Existing Zoning for Agricultural Use, and/or the **Permanent Conversion of Lands that have a Williamson Act Contract**	Sites Reservoir Inundation Area and Sites Reservoir Dams; Recreation Areas; Road Relocations, South Bridge, and TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Asphalt Batch Plant; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; Delevan Transmission Line; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility; Electrical Distribution Lines; Project Buffer (operation and maintenance)	Significant	Mitigation Measure Land-5b: Acquire Lands Through Eminent Domain Mitigation Measure Land-5c: For Land Permanently Acquired other than by Eminent Domain, Seek County Approvals to Rescind Williamson Act Contracts and Enter in Open Space Contracts or Open Space Easements	Less than Significant Less than Significant or Significant and Unavoidable

Table 20-28
Summary of Mitigation Measures for NODOS Project Impacts to Land Use

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Land-6: Permanent Conflict with Existing Zoning for, or Cause Rezoning of, Forest Land, Timberland, or Timberland Zoned Timberland Production	Sites Reservoir Inundation Area and Sites Reservoir Dams; Recreation Areas; Road Relocations, South Bridge, and TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Asphalt Batch Plant; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; Delevan Transmission Line; Project Buffer (operation and maintenance)	Significant	Mitigation Measure Land-5a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Zoning Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Impact Land-7: The Permanent Loss of Forest Land or Permanent Conversion of Forest Land to Non-Forest Use	Sites Reservoir Inundation Area and Sites Reservoir Dams, Recreation Areas, Project Buffer (operation and maintenance)	Significant	Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable
Impact Land-8: Other Changes in the Environment which, due to their Location or Nature, could Result in the **Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use** or Permanent Conversion of Forest Land to Non-Forest Use	Sites Reservoir Inundation Area and Sites Reservoir Dams; Recreation Areas; Road Relocations, South Bridge, and TRR Pipeline Road; Sites Pumping/Generating Plant; Sites Electrical Switchyard; Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure; Sites Reservoir Inlet/Outlet Structure; Field Office Maintenance Yard; Asphalt Batch Plant; Holthouse Reservoir Complex; Holthouse Reservoir Electrical Switchyard; Delevan Pipeline Electrical Switchyard; TRR; TRR Pumping/Generating Plant; GCID Canal Connection to the TRR; TRR Electrical Switchyard; Delevan Pipeline and TRR Pipeline; Delevan Transmission Line; Delevan Pipeline Intake Facilities; Delevan Pipeline Discharge Facility; Project Buffer (operation and maintenance)	Significant	Mitigation Measure Land-4a: Enter into Agricultural Conservation Easements with Glenn and Colusa Counties	Less than Significant

Table 20-28
Summary of Mitigation Measures for NODOS Project Impacts to Land Use

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Land-8: Other Changes in the Environment which, due to their Location or Nature, could Result in the Permanent Conversion of Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Local Potential Farmland to Non-Agricultural Use or **Permanent Conversion of Forest Land to Non-Forest Use**	Sites Reservoir Inundation Area, Sites Reservoir Dams, Project Buffer (operation and maintenance)		Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses	Less than Significant or Significant and Unavoidable

"Temporary" impacts, as discussed in this chapter, are the "construction" impacts listed in this table. "Permanent" impacts, as discussed in this chapter, are the "operation and/or maintenance" impacts listed in this table.

Note:
LOS = Level of Significance

Mitigation Measure Land-2a: To the Extent Possible, Work with Glenn County to Encourage the County to Modify or Amend the Glenn County General Plan to Bring it into Consistency with the Proposed Project Land Uses

Prior to the start of Project construction, DWR and Reclamation shall, to the extent possible, work with Glenn County to modify or amend its General Plan for consistency with proposed Project land uses, or to implement other appropriate measures to minimize conflicts between the Project and County policies.

Mitigation Measure Land-2b: Execute an Agreement with NRCS to Amend WRP Easement Contract and Conduct Post-Construction Wetland Restoration

Prior to the start of Project construction, DWR and Reclamation shall execute an agreement with NRCS to amend the existing WRP easement contract to allow the construction and operation of the Delevan Transmission Line and Delevan Pipeline. Project Engineers shall design the transmission line and the construction contractor shall install the transmission line tower footings to span the parcel of land that has the WRP easement (a distance of approximately 680 feet). Project Engineers shall design the pipeline and the construction contractor shall install the pipeline to avoid the wetlands in the subject parcel of land, to the extent feasible. The pipeline length across the subject parcel is approximately 650 feet. Upon completion of pipeline installation, the area that was disturbed by Project construction shall be restored to a functional wetland condition.

Mitigation Measure Cul-4a: Relocation of Known Cemeteries

Consultation shall occur with the entity (County, City, private) that has jurisdiction over the cemetery, and interested parties as appropriate, to identify a satisfactory place that is protected from future disturbance for the relocation of human remains. Similarly, if Native American burials are known to exist in an archaeological site, the Project proponent shall work with the appropriate tribe to identify a satisfactory location for re-interment of burials in a protected location.

Mitigation Measure Land-3a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Land Use Designations to Bring them into Consistency with the Proposed Project Land Uses

Prior to the start of Project construction, DWR and Reclamation shall, to the extent possible, work with Glenn and Colusa counties to modify or amend the counties' General Plan land use designations, or to implement other appropriate measures to eliminate the Project's conflicts with those designations.

Mitigation Measure Land-3b: Execute an Agreement with Maxwell Irrigation District to Minimize and Avoid Short-term and Long-Term Impacts to Existing Facilities and Operations

Prior to the start of Project construction, DWR and Reclamation shall execute an agreement with the Maxwell Irrigation District to ensure that Project construction and operation of the Delevan Pipeline Intake Facilities or the Delevan Pipeline Discharge Facility will not adversely affect the operation of the existing adjacent Maxwell Irrigation District facility.

Mitigation Measure Land-4a: Enter into Agricultural Conservation Easements with Glenn and Colusa Counties

DWR and Reclamation shall enter into agricultural conservation easement**s** with Glenn and Colusa counties **for** lands used for agricultural production to ensure agriculture remains viable in perpetuity and to prevent incompatible development on the selected parcels.

Mitigation Measure Land-5a: To the Extent Possible, Work with Glenn and Colusa Counties to Encourage the Counties to Modify or Amend the Glenn County and Colusa County General Plans' Zoning Designations to Bring them into Consistency with the Proposed Project Land Uses

Prior to the start of Project construction, DWR and Reclamation shall, to the extent possible, work with Glenn and Colusa counties to modify or amend the counties' zoning designations, or to implement other appropriate measures to eliminate the Project's conflicts with those designations.

Mitigation Measure Land-5b: Acquire Lands through Eminent Domain

During the Project land acquisition process, DWR and Reclamation shall acquire parcels through eminent domain.

Mitigation Measure Land-5c: For Land Permanently Acquired other than by Eminent Domain, Seek County Approvals to Rescind Williamson Act Contracts and Enter into Open Space Contracts or Open Space Easements

Prior to permanently acquiring lands other than by eminent domain during the land acquisition process, DWR and Reclamation shall seek County approvals to rescind Williamson Act Contracts and enter into Open Space Use Agreements or Open Space Easements with the counties.

There is no feasible mitigation for **Impact Land-1** as it relates to the Town of Sites, so it is considered significant and unavoidable.

Implementation of **Mitigation Measures Land-2b, 3a** (for some Project facilities), **3b, 4a, 5b,** and **Cul-4a,** would reduce the level of significance of Project impacts to **less than significant**.

Implementation of **Mitigation Measures Land-2a, 3a** (for some Project facilities), **5a,** and **5c** would reduce the level of significance of Project impacts to less than significant if DWR and Reclamation are successful in working with the counties regarding consistency with the General Plans, General Plan land use designations, General Plan zoning designations, and/or regarding Williamson Act contracts. If working with the counties does not result in the Project being consistent with the counties' General Plans, General Plan land use designations, General Plan zoning designations, and/or regarding Williamson Act contracts, these impacts are considered **significant and unavoidable**.

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21. Recreation Resources

21.1 Introduction

This chapter provides a description of the recreation resources setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Recreation is one of several benefits typically provided by public and private water supply projects. The amount of visitation at regional lakes and reservoirs can reasonably be expected to increase as the population of California increases. Projections indicate that the population of California, which was nearly 37 million in 2005, is expected to exceed 49 million in 2030 (DOF, 2007).

Popular recreation activities in California fall into two categories: (1) water-dependent activities, such as boating, waterskiing, swimming, and fishing; and (2) water-enhanced activities, such as wildlife viewing, camping, hiking, and hunting. The quality of the recreation experience at lakes, reservoirs, and streams depends on water levels, natural conditions, and the level of facility development.

The regulatory setting for recreation resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively, except when quantitative estimates were possible. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

21.2 Affected Environment

21.2.1 Extended, Secondary, and Primary Study Areas

21.2.1.1 Methodology

<u>Recreation Resources, Use, and Capacity</u>

There are approximately 1,400 reservoirs in California. Their function is to store and distribute water to supplement the needs of agriculture and urban water users. Some provide hydropower and flood control benefits. Recreation is also a beneficial use of many of these facilities. The level of detail for existing recreation resources varies, based on whether the resource would be affected by the Project. This analysis is based upon the recreation areas as they existed as of June 2009.

The following key sources of information were used in the preparation of this chapter:

- Recreation studies completed for the SWP Oroville Facilities Federal Energy Regulatory Commission (FERC) relicensing (2003 to 2004) (DWR, 2007a)
- CALFED Final Programmatic EIS/EIR (CALFED, 2000)
- North-of-the-Delta Offstream Storage Investigation Report, Appendix J – Recreation (Rischbieter and Elkins, 2000)
- Comparative Inventory of Recreation Facilities at California's Largest Reservoirs (Rischbieter, 2001)

- Sacramento River Public Recreation Access Study (EDAW, 2003)
- South Delta Improvements Program Draft EIR/EIS (Reclamation, 2005)
- Recreation Facilities of the State Water Project: An Inventory (Thrapp, 1989)
- Recreation Lakes of California (14th Edition) (Dirksen and Dirksen, 2003)
- Regional recreation guides
- Internet websites (Refer to Section 21.5 References)

Some of the recreation areas were visited to verify facility information. Detailed recreation use data were collected for Black Butte Lake and East Park Reservoir in 2000.

Recreation use is measured in recreation days (or recreation visitor days), with one recreation day representing one person spending a day or a portion of a day in one or more types of recreation activities[1]. For the purposes of this analysis, the peak recreation season is defined as Memorial Day weekend through Labor Day weekend (approximately 100 days), and the primary recreation season is considered to be from May 1 through September 30. At some areas, recreation occurs much earlier or later in the year depending on elevation and weather (i.e., an extended recreation season). In general, the primary recreation season is defined as those months when visitation equals or exceeds the monthly average for the year.

Recreation resource capacity can be measured by looking at availability of space, number and condition of facilities, visitor perceptions, or the ecological carrying capacity of the affected sites. Capacity is the number of visitors that a site is capable of handling with no apparent or undue environmental degradation (California State Parks, 2004). For the tables presented in this chapter that specify recreation use and capacity at reservoirs in the Extended and Secondary study areas (in Sections 21.2.2.1 and 21.2.3.1), the recreation capacity was based on the number of campsites, picnic areas, boat launches, and other facilities at each reservoir, and an estimate of optimum carrying capacity in persons for each recreation resource over a typical recreation seasonal period. This number was compared to the reported recreation use to derive a capacity percentage.

21.2.2 Extended Study Area

21.2.2.1 Recreation Resources, Use, and Capacity

This section includes descriptions of CVP, SWP, local water-dependent or water-enhanced recreation resources, and the wildlife refuges in the Extended Study Area. Table 21-1 shows the recreation use and capacity at the reservoirs within the Extended Study Area, and Figure 21-1 depicts the existing lakes and reservoirs.

[1]This is one standard definition of a recreation visitor day, but should not to be confused with the 12-hour recreation visitor day definition used by some federal agencies.

Table 21-1
Recreation Use and Capacity at Reservoirs in the Extended Study Area[a]

Name	Storage Capacity (Acre-Feet)	Surface Area (Acres)	Shoreline (Miles)	Approximate Recreation Capacity[b]	Approximate Recreation Use[b]	Capacity (Percent)	Operator[c]	County
Tri-Dam Reservoirs[d]	932,000	14,000	146	1,090,000	900,000	83	USACE, EBMUD	Calaveras, San Joaquin, Amador
New Melones Reservoir[e]	2,400,000	12,500	100	700,000	500,000	71	Reclamation	Calaveras, Tuolumne
Don Pedro Reservoir[d]	2,030,000	12,960	160	660,000	450,000	68	TID	Tuolumne
Lake McClure[d]	1,032,000	7,147	80	956,000	600,000	63	MIDPD	Mariposa
San Luis Reservoir SRA[f]	2,095,000	15,400	77	1,036,000	492,000	47	DWR/State Parks	Merced
Pyramid Lake SRA[f]	180,000	1,360	21	285,000	126,000	44	DWR	Los Angeles
Castaic Lake SRA[f]	323,700	2,235	29	1,300,000	614,000	47	DWR/State Parks	Los Angeles
Silverwood Lake SRA[f]	78,000	990	13	690,000	330,000	48	DWR/State Parks	San Bernardino
Lake Perris SRA[f]	131,450	2,340	10	1,144,000	872,000	76	DWR/State Parks	Riverside
Totals and Percent Capacity	**9,202,150**	**68,932**	**636**	**7,861,000**	**4,884,000**	**62**		

[a]It is difficult to obtain recent reported recreation information because many agencies no longer collect and report this information. The recreation use reported is approximate and represents an average of the three most recent years of available data, or a single year when only one year was available. Although the data indicate that recreation use does not currently meet or exceed the capacity of the recreational facilities at these reservoirs, some of them may be at or near capacity on a few summer weekends and especially on holiday weekends, such as Memorial Day and July 4th weekends.

[b]The units for Recreation Capacity and Recreation Use are recreation visitor days (RVDs), defined as a visit by one person for part or all of one day.

[c]USACE= U.S. Army Corps of Engineers; EBMUD = East Bay Municipal Utility District; Reclamation = U.S. Bureau of Reclamation; TID = Turlock Irrigation District; MIDPD = Merced Irrigation District Parks Department; DWR = California Department of Water Resources; State Parks = California Department of Parks and Recreation;

[d]Local Agency water project.

[e]Central Valley Project

[f]State Water Project

Note:

SRA = State Recreation Area

Sources: Rischbieter, 2001; DWR, 2007b, 2008, and 2012, Stienstra, 2004; Dirksen and Dirksen, 2003; California State Parks, 2011; Dean's AnglerNet.com, 2011; FishersNet.com, 2011; Fishniffer.com, 2011.

Tri-Dam Reservoir Complex

The Tri-Dam Reservoir Complex includes New Hogan, Comanche, and Pardee reservoirs. Recreation opportunities include camping, fishing, and boating. New Hogan Reservoir facilities include three campgrounds, day-use and picnic areas, two launch ramps and a marina. Comanche Reservoir provides six campgrounds and two day-use areas, plus two boat ramps at concessionaire-operated marinas. Water skiing and swimming is allowed. Pardee Reservoir facilities include two campgrounds and several day-use areas, with one boat ramp and a large marina. Shoreline access is restricted at these two reservoirs and there is virtually no opportunity for recreation outside the developed areas. Swimming is prohibited at Pardee Reservoir (Rischbieter, 2001).

New Melones Reservoir

New Melones Reservoir is the fourth-largest reservoir in California. It was constructed by the U.S. Army Corps of Engineers (USACE) for water, power, and flood control, as well as recreation. The facilities and recreation opportunities are currently administered by the U.S. Bureau of Reclamation (Reclamation).

Despite its very large size, New Melones has only two public recreation areas with camping facilities: the Glory Hole Recreation Area and the Tuttletown Recreation Area. However, there are five campgrounds with more than 300 campsites, four boat ramps, and a large marina, as well as several developed and primitive areas for day-use shoreline access (Rischbieter, 2001).

Don Pedro Reservoir

Don Pedro is the fifth largest reservoir in California. It is located in the Sierra Nevada foothills east of the cities of Modesto and Stockton. Built in a deep canyon of the Tuolumne River, Don Pedro Reservoir provides water, power, and flood control benefits for Turlock Irrigation District. The recreational facilities are maintained and operated by the Don Pedro Recreation Agency. The facilities include three recreation areas and two full-service marinas. The recreation areas include launch ramps, picnic facilities, and a total of 550 campsites. Boat-in camping is allowed, but there is little opportunity for roadside access (Rischbieter, 2001).

Lake McClure

Located in the Mother Lode Country of the Sierra foothills, Lake McClure is the closest reservoir to the City of Modesto. Lake McClure has four developed recreation areas and a fifth at Lake McSwain (the small re-regulation reservoir located downstream), all operated by Merced Irrigation District Parks Department. The campgrounds are equipped with bathrooms, showers, laundry facilities, and marina facilities. Day use areas include sandy beaches and swim lagoons, often in grassy park-like settings, that include group facilities and play equipment (Rischbieter, 2001).

San Luis Reservoir

San Luis Reservoir, a joint CVP/SWP facility, is the largest reservoir in the San Joaquin Valley. O'Neill Forebay and San Luis Reservoir are part of the San Luis Reservoir State Recreation Area (SRA), which also includes the Los Banos Detention Reservoir. The forebay has relatively stable water levels and provides popular swimming, boating, fishing, and camping opportunities.

In contrast, San Luis Reservoir has a very large annual water level fluctuation and frequent strong afternoon winds, so its primary activities are fishing, boating, wind surfing, and picnicking. San Luis Reservoir and O'Neill Forebay have two developed campgrounds and one primitive campground. There are four boat ramps at the two lakes, plus extensive day use areas with lawns and beaches at O'Neill Forebay. All facilities are operated by the California Department of Parks and Recreation (Rischbieter, 2001).

San Luis Reservoir has two major boat ramps: the Basalt boat ramp near Basalt Campground, and the Dinosaur Point boat ramp at the west end of San Luis Reservoir. Table 21-2 details the size and operating range of these ramps.

Table 21-2
San Luis Reservoir State Recreation Area Boat Ramp Bottom Elevations

	Elevation (Feet)	Feet Below MNWS	Number of Boat Ramp Lanes
Dinosaur Point Boat Ramp	378	166	4
Basalt Boat Ramp	340	204	2

Note:
Maximum Normal Water Surface (MNWS) elevation occurs at 544 feet.

Source: Martin, pers. comm., 2011.

The Basalt Campground receives its water supply from the reservoir at the Basalt Water Intake. The water intake is located at elevation 345.

Pyramid Lake State Recreation Area

Pyramid Lake has 21 miles of shoreline and a surface area of 1,297 acres. Recreation opportunities include boating, swimming, picnicking, camping, and fishing. The shoreline is rugged and accessible only by boat. The nearby Los Alamos campground has 93 campsites and two group campgrounds. Boat-in picnic sites and restrooms are scattered around the lake at several locations. The recreation program at the lake is administered by a concessionaire operating pursuant to an agreement with the U.S. Forest Service (USFS) (Thrapp, 1989).

Castaic Lake State Recreation Area

Castaic Lake and Lagoon has 29 miles of shoreline, and its afterbay Lagoon has three miles of shoreline. Together, they provide many opportunities for recreation, including a 60-unit campground and a group campground. There are two boat launches for water sports, including sailing, fishing, and power boating. The lagoon has one ramp and is limited to non-power boats. Visitors may sail, canoe, or fish (Dirksen and Dirksen, 2003). A grassy area is available for outdoor events. The recreational facilities at this SWP reservoir are operated by Los Angeles County. Castaic Lake State Recreation Area is operated by the California Department of Parks and Recreation.

Silverwood Lake State Recreation Area

Silverwood Lake SRA occupies 2,400 acres. The lake has 13 miles of shoreline and a surface area of approximately 1,000 acres. The lake is open to all types of boating, although several brushy areas were not cleared and provide natural fish habitat for anglers. There are two campgrounds, a group camp, a visitor information building, and three boat-in picnic areas. Recreational activities include swimming, boating, waterskiing, fishing, hiking, camping, picnicking, and bicycling. Silverwood Lake SRA is operated by California State Parks (Dirksen and Dirksen, 2003).

Lake Perris State Recreation Area

Lake Perris, operated by California Department of Parks and Recreation, is the southernmost reservoir of the SWP. There are 421 RV and tent campsites and six group campgrounds, a full service marina and boat ramp, and swimming and ski beaches. Recreation activities include swimming, horseback riding, sailing, power boating, camping, water skiing, fishing, hiking, bicycling, hunting, and rock climbing (Dirksen and Dirksen, 2003). As of 2013, Lake Perris is operating at reduced water and visitor capacity until remediation of seismic concerns at Perris Dam is completed.

Wildlife Refuges and Wildlife Areas

There are several wildlife refuges in the Extended Study Area from San Luis Reservoir to Kern County that receive Level 4 refuge water (Figure 1-7 in Chapter 1 Introduction): the West Bear Creek Unit of the San Luis National Wildlife Refuge (NWR) Complex; the Los Banos, Volta, and Mendota Wildlife Areas (WAs); the Merced Unit of the Merced NWR; the China Island and Salt Slough units of the North Grasslands WA; private wetlands in the Grassland Resource Conservation District; and Kern and Pixley NWRs. Recreation activities within these refuges include hunting, fishing, wildlife observation, photography, and environmental education programs (Reclamation, 2011).

21.2.3 Secondary Study Area

21.2.3.1 Recreation Resources, Use, and Capacity

This section includes descriptions of CVP, SWP, and local water-dependent or water-enhanced recreation resources in the Secondary Study Area. The existing lakes and reservoirs are listed in Table 21-3, and are depicted on Figure 21-2.

Table 21-3
Recreation Use and Capacity at Reservoirs in the Secondary Study Area[a]

Name	Storage Capacity (Acre-Feet)	Surface Area (Acres)	Shoreline (Miles)	Approximate Recreation Capacity[b]	Approximate Recreation Use[b]	Capacity (Percent)	Operator[c]	County
Shasta Lake NRA[e]	4,552,000	29,740	370	2,370,000	2,330,000	98	Reclamation, USFS	Shasta
Trinity/Lewiston Lake NRA[e]	2,462,000	17,085	160	1,180,000	425,000	36	Reclamation, USFS	Trinity
Whiskeytown NRA[e]	241,000	3,220	36	1,230,000	773,000	63	Reclamation, NPS	Shasta
Lake Almanor[d]	1,300,000	28,200	52	460,000	244,000	53	PG&E, USFS	Plumas
Lake Red Bluff[e]	3,920	530	6	135,000	65,000	48	Reclamation, USFS	Tehama
Black Butte Reservoir[e]	144,000	4,560	40	300,000	220,000	73	USACE	Tehama/Glenn
Lake Oroville[f]	3,538,000	15,800	167	2,100,000	1,200,000	57	DWR, State Parks	Butte
Stony Gorge Reservoir[e]	50,000	1,280	25	67,000	50,000	75	Reclamation	Glen
New Bullard's Bar Reservoir[d]	970,000	4,810	60	200,000	104,000	52	YCWA	Yuba
East Park Reservoir[e]	51,000	1,820	25	245,000	53,000	22	Reclamation	Colusa
Englebright Reservoir[e]	70,000	815	24	157,000	105,000	67	USACE	Yuba
Indian Valley Reservoir[d]	300,000	4,000	40	76,000	50,000	66	YCFCWCD	Lake
Clear Lake[d]	315,000	43,800	100	1,500,000	1,000,000	67	YCFCWCD, State Parks, Private	Lake
Folsom Lake SRA[e]	975,000	11,450	75	2,200,000	1,000,000	45	Reclamation, State Parks	Sacramento
Lake Berryessa[e]	1,600,000	20,700	165	1,700,000	1,400,000	82	Reclamation, Concession	Napa
Totals and Percent Capacity	**16571,920**	**188,100**	**1,345**	**13,920,000**	**9,019,000**	**65**		

[a]It is difficult to obtain recent reported recreation information because many agencies no longer collect and report this information. The recreation use reported is approximate and represents an average of the three most recent years of available data, or a single year when only one year was available. Although the data indicate that recreation use does not currently meet or exceed the capacity of the recreational facilities at these reservoirs, some of them may be at or near capacity on a few summer weekends and especially on holiday weekends, such as Memorial Day and July 4th weekends.

[b]The units for Recreation Capacity and Recreation Use are recreation visitor days (RVDs), defined as a visit by one person for part or all of one day.

[c]Reclamation = U.S. Bureau of Reclamation; USFS = U.S. Forest Service; NPS = National Park Service; PG&E = Pacific Gas and Electric Company; DWR = California Department of Water Resources; State Parks = California Department of Parks and Recreation; YCWA =Yuba County Water Agency; USACE = U. S. Army Corps of Engineers; YCFCWCD = Yolo County Flood Control & Water Conservation District; Concession = Concessionaires for Reclamation.

[d]Local Agency Water Project

[e]Central Valley Project

[f]State Water Project

Sources: Rischbieter, 2001; DWR, 2007b, 2008, and 2012; Guthrie et. al., 1995; Dirksen and Dirksen, 2003; Stienstra, 2004; Dean's AnglerNet.com, 2011; FishersNet.com, 2011; Fishsniffer.com, 2011; USFS, 2011.

Klamath River

Recreation activities on the Klamath River (upper and lower) include kayaking, boating, fishing, and hunting. The Klamath River is also popular for whitewater rafting and recreational gold mining. The river is 263 miles long, and flows through the Klamath and Six Rivers national forests in California. Several wildlife refuges near the Oregon border offer hunting, wildlife viewing, and other recreation resources. The Klamath Wildlife area in southern Oregon is adjacent to the river (Mt. Shasta Region Travel Center, 2011). A total of 250.8 miles of the Klamath River, from 100 yards downstream of the Iron Gate Dam to the river mouth at the Pacific Ocean, is designated as "recreational[2]" in the State and federal Wild and Scenic River acts. The federal act also designates 11.7 miles of the Klamath River as "wild[3]", and 23.5 miles as "scenic[4]" (NWSRS, 2013; CPRC, 2013).

Trinity River

The Trinity River ranges from stretches of calm water to rapids and cascades. SR 299 is adjacent to the river for many miles, allowing access for recreation activities that include fishing, hiking, swimming, rafting, kayaking, recreational gold mining, and wildlife viewing. The Trinity River is widely known for its fishing opportunities (Trinity County Visitors Guide, 2011). Most of the Trinity River from 100 yards downstream of Lewiston Dam to its confluence with Klamath River at Weitchpec is designated as either "recreational" (120 miles), "scenic" (39 miles), or "wild" (44 miles) in the State and federal Wild and Scenic Rivers acts (NWSRS, 2013; CPRC, 2013).

Whiskeytown-Shasta-Trinity National Recreation Area

The Whiskeytown-Shasta-Trinity National Recreation Area (NRA) includes Trinity Lake, Lewiston Lake, Shasta Lake, Keswick Reservoir, and Whiskeytown Lake. The lakes are components of the CVP. Of the five lakes, Shasta is the largest and receives most of the recreation use. Water levels at Shasta and Trinity lakes fluctuate, based on water supply and demand, but levels at Whiskeytown, Lewiston, and Keswick do not change much during the recreation season (Reclamation, 2005.)

Trinity Lake is the third largest reservoir in California, with more than 147 miles of shoreline. Recreation opportunities and much of the lands surrounding this component of the NRA are managed by USFS. Anglers fish along the shore for various fish species. Private resorts and Forest Service campgrounds offer facilities ranging from housekeeping cabins to rustic campgrounds. Four marinas offer houseboat, skiboat, fishing boat, canoe, and jetski rentals. The maximum storage capacity of Trinity Lake is 2,447,000 acre-feet at elevation 2,370 feet. However, the lake is rarely allowed to store water at full capacity because of its flood control requirements. The only month when the lake is allowed to fill completely is June; the lake is, therefore, rarely full during the remaining months of the primary recreation season.

Trinity Lake has seven ramps at elevations from 2,170 feet to the maximum water surface elevation of 2,370 feet (Table 21-4). Four of the ramps (Stuart Fork, Bowerman, Clark Springs, and Fairview) are relatively short and are out of the water when Trinity Lake is drawn down 60 feet (to elevation 2,310 feet).

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[2] Wild = those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

[3] Scenic = those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

[4] Recreational = those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shoreline, and that may have undergone some impoundment or diversion in the past.

Table 21-4
Trinity Lake Boat Ramp Bottom Elevations

	Elevation (Feet)	Feet Below MNWS	Boat Ramp Lanes
Stuart Fork	2,338	32	2
Clark Springs	2,324	46	2
Bowerman	2,323	47	2
Fairview	2,313	57	3
Trinity Center	2,300	70	3
Cedar Stock	2,230	140	3
Minersville	2,170	200	2

Note:
Maximum Normal Water Surface (MNWS) elevation occurs at 2,370 feet.
Source: Reclamation, 2005; USFS, 2011.

When Trinity Lake reaches elevation 2,300 feet, which often occurs in July, August, or September, only the Minersville and Cedar Stock boat ramps are available. Minersville becomes usable when the lake drops to elevation 2,305. It is the only ramp extending below elevation 2,230, so in late summer during Critical years, it is the only available boat ramp on Trinity Lake.

Lewiston Lake is best known for its quality fly fishing and is also popular with trollers and bank anglers. A 10-mile-per-hour speed limit makes the lake popular with float tubers and canoeists. The area also offers excellent wildlife viewing and recreation on the lands surrounding the reservoir, which are managed by USFS.

Shasta Lake is the largest reservoir in California and the primary water storage facility of the CVP. It has 29,740 surface acres and more than 370 miles of shoreline. Recreation on and around this portion of the NRA is also managed by USFS. Much of the outdoor recreation and tourism in Shasta County is related to Shasta Lake. There are several marinas, campgrounds, boat-in campgrounds, boat ramps, and related facilities around Shasta Lake (USFS, 2011). Shasta Lake is very popular for houseboating and other water sports, as well as a major fishing destination. There are more than 16 species of fish available. Bass fishing tournaments are frequently held at the lake. Of the seven public boat ramps at Shasta Lake (Table 21-5), only the Centimudi and Jones Valley boat ramps extend more than 160 feet down in elevation. Commercial ramps at Bridge Bay Resort, Digger Bay Marina, and Silverthorn Marina also may be available to the public.

Keswick Reservoir is the afterbay for Shasta Lake and regulates the hydropower releases. It is approximately five miles long with a surface area of 630 acres. Most of its shoreline is steep and brushy, providing limited access for shore anglers. There is a small paved boat ramp and vault toilets at the day-use area. Fed by cold water released from the penstocks at Shasta Dam, Keswick is used little except for a few anglers who fish when the power plants at Shasta Dam are operating. BLM manages much of the recreation opportunities surrounding the reservoir. An extensive off-highway vehicle, mountain bike, and national recreation trail comprises a majority of the recreation use around the reservoir.

Recreation around Whiskeytown Lake is operated by the National Park Service and offers 3,220 surface acres and 36 miles of shoreline. There are two major campgrounds and two day-use areas with swimming beaches plus complete marina facilities at two of the three boat ramps. Houseboats or overnight stays on boats are not allowed. Fishing occurs from boats and from the shore (Dirksen and Dirksen, 2003; Stienstra, 2004).

Table 21-5
Shasta Lake Boat Ramp Bottom Elevations

	Elevation (Feet)	Feet Below MNWS	Boat Ramp Lanes
Bailey Cove	1,017	50	2
Antlers	992	75	4
Hirz Bay	972	95	2 to 3
Packers Bay	952	115	2 to 4
Silverthorn Marina[a]	942	125	1 to 2
Digger Bay Marina[b]	937	130	2
Sugarloaf[c]	907	160	2
Bridge Bay Resort	882	185	2
Centimudi	857	210	2 to 4
Jones Valley	857	210	1 to 4

[a]Silverthorn ramp is not paved from elevation 1,023 feet to elevation 942 feet.
[b]Digger Bay ramp is usable to elevation 930 feet on an unpaved ramp.
[c]Sugarloaf ramp is a low water ramp that is not available until elevation 992 feet.

Note:
Maximum Normal Water Surface (MNWS) elevation occurs at 1,067 feet.

Source: USFS, 2011.

Clear Creek

Lower Clear Creek begins downstream of Whiskeytown Lake on National Park Service lands; the upstream portion of lower Clear Creek is part of the Whiskeytown-Shasta-Trinity NRA. Downstream of the NRA, the majority of the land surrounding the creek is owned by the U.S. Bureau of Land Management (BLM). BLM lands within the lower Clear Creek corridor receive substantial public recreational use. Recreational opportunities include swimming, beach use, hiking, fishing, limited hunting, kayaking, gold panning, and bird watching. Salmon spawning viewing is also an important recreation activity during the fall. A recreation survey conducted in 1980 concluded that there were 15,000 recreation user days along lower Clear Creek during the summer months, but this survey was conducted prior to the increase in BLM-managed lands along lower Clear Creek, when most lands were in private holdings (BLM, 2008).

Spring Creek

Spring Creek flows are regulated by Spring Creek Dam and diluted by flows from Whiskeytown Lake via the Clear Creek Tunnel. Spring Creek flows are contaminated with acid mine drainage from the Iron Mountain Mine, which is located on upstream tributaries of the creek and is designated as a Superfund site. Consequently, no recreation occurs along this reach of Spring Creek.

Sacramento River – Shasta Dam (Keswick) to Colusa (Sacramento River Conservation Area)

The main river recreation resources and public access sites within the Secondary Study Area are located along the Sacramento River from the Shasta Dam to the City of Colusa. These resources include day use sites, boat launches, trail accesses, fishing accesses, recreational vehicle parks, wildlife areas, and undeveloped open space areas.

Between Keswick Dam (downstream of Shasta Dam) and the City of Red Bluff, much of the Sacramento River is confined by geology and narrow bands of riparian forest, but from Red Bluff to the City of Chico, the river meanders over a broad floodplain. From Chico to Colusa, sloughs and broad basins extend for miles on either side of the river. There is also an extensive system of levees and weirs for flood control purposes. These conditions create many opportunities for water-based recreation. Fly fishing and conventional fishing in and along the Sacramento River occur year-round. Various fish species are abundant at different times during the year. Fishing is popular downstream of the Red Bluff Diversion Dam (RBDD). In addition, rafting, canoeing, camping, and swimming are popular activities. Power boat use and whitewater rafting require a minimum river flow of at least 5,000 cfs. Tables 21-6A and 21-6B list existing public recreation sites between Red Bluff and Colusa on the Sacramento River (EDAW, 2003). Recreation use along the Sacramento River is generally less than the capacity of the recreation sites, with the exception of occasional special events, such as those that occur on major holiday weekends or during periods of exceptional salmon fishing.

Recreational use of the Sacramento River and its tributaries probably has paralleled increased population growth in the region. It is expected that demand for recreation activities, such as bird watching, wildlife viewing, nature observation, and hiking, will increase over the next 40 years, and the demand for traditional Sacramento River recreation uses, such as hunting, fishing, and boating, will continue (EDAW, 2003). However, salmon fishing recently declined due to closed fall-run Chinook salmon seasons in 2008 and 2009, and a restricted fall-run Chinook salmon season in 2010 (Lyons, pers. comm., 2012).

Lake Almanor

Lake Almanor has the second largest surface area among California's reservoirs. Recreation opportunities are provided by 22 resorts with five full-service marinas with rental boats, and moorage for private boats. Much of the lakeshore is private property, but there are stretches of National Forest lands open to the public and an extensive paved bicycle path on the west side of the lake. The Forest Service and PG&E also provide a few public facilities (Rischbieter, 2001; PG&E, 2002).

Lake Red Bluff Recreation Area

The Lake Red Bluff Recreation Area is administratively managed and operated by the Mendocino National Forest. However, the federal lands in this area are owned by Reclamation and are adjacent to the RBDD within the city limits of Red Bluff. Approximately 65,000 people recreated in and along the Sacramento River near the RBDD in 1995 (Guthrie, et al., 1995). Most of them used one of three locations: City Park, Ide Adobe State Historical Park, and the boat launch ramp area at the Lake Red Bluff Recreation Area. The majority of this use occurred in the summer months during the "gates in" period of the RBDD (Reclamation, 2002). However, Lake Red Bluff no longer exists because the gates that formed it were permanently raised in 2012.

Black Butte Reservoir

Black Butte Reservoir is located on Stony Creek, approximately eight miles west of the town of Orland in northern Glenn and southern Tehama counties, in a transition zone between the Sacramento Valley and the foothills of the Coast Range at an elevation of 470 feet. There are six recreation areas, a dam overlook, and several nature trails. Each recreation area includes restrooms and fishing access with other facilities, including campgrounds, a marina, boat ramps, an outdoor amphitheater, fish cleaning stations, and an off-highway vehicle park. Recreation lands surrounding the reservoir total approximately 4,000 acres (Rischbieter and Elkins, 2000).

Table 21-6A
Recreation Sites and Amenities on the Sacramento River from Red Bluff to Colusa

		Access			Site Amenities and Uses																																						Site Characteristics						
		Mode of Access			Facility Signage				Boating Facilities				On-Site Parking				Pedestrian Access			Overnighting (R=Reservable/ NR=Non-Reservable)					Water		Picnic Sites				Toilet Facilities				Other Amenities		Recreation Uses						Shore Characteristics						
Site Name	Acres	Public Use Allowed	Public Road	River	Entrance	Directional	Facility Rules	Services	Marina	Ramp(s)	Carry-in	Boat Dock/Landing	Asphalt Lot	Gravel Lot	Boat Trailer Parking	Dirt Lot	ADA Accessible	Paved Walks	Unpaved Walks/Trails	Tent sites	Tent/Trailer Sites	RV Sites	Group Camps	Cabins	Potable Water	Drinking Fountains	Picnic Tables	Picnic Shelters	BBQ Grills/Pits	Informal/Tree Shaded	Flush Toilets & Sinks	Pit/Chemical Toilets	Porta-potties	None	Showers	Public Phones	Store/Bar/Restaurant	Fishing	Hiking	Hunting	Passive Recreation	Wildlife Observation	Steep/Cut Embankment	Sandy Beach	Grassy/tule	Shrubby	Undercut	Overhanging Shrubs	Overhanging Trees
Federal Facilities																																																	
Bureau of Reclamation																																																	
Altube Island				☒																														☒															
Bureau of Land Management																																																	
Todd Island	~125			☒																														☒															
Foster Island	222			☒																														☒															
Fish and Wildlife Service																																																	
Sacramento River National Wildlife Refuge																																																	
Capay Unit	666																																																
Codora Unit	394																																																
Deadman's Reach	637																																																
Flynn Unit	552																																																
Heron Island Unit	116																																																
Jacinto Unit	82																																																
La Barranaca Unit	1067																																																
Llano Seco unit	907																																																
McIntosh Landing North	60																																																
McIntosh Landing South	71																																																
Mooney Unit	344																																																
North Ord Unit	43																																																
Ohm Unit	750																																																
Ord Unit	100																																																
Packer Lake Unit	375	☒	☒								☒					☒																						☒				☒				☒			
Phelan Island	308																																																
Pine Creek Unit	435																																																
Rio Vista Unit	1202	☒	☒	☒							☒					☒																		☒				☒				☒				☒			
South Ord Unit	122																																																
Sul Norte Unit	600																																																
Forest Service																																																	
Lake Red Bluff Recreation Area	~488	☒	☒	☒	☒	☒	☒			2				☒	☒		☒	☒	☒		30/NR		☒	☒	☒	☒	☒	☒	☒	☒	☒				☒	☒		☒		☒		☒	☒						
State Facilities																																																	
Department of Parks and Recreation																																																	
Bidwell-Sacramento River SRA																																																	
Big Chico Creek Day-use Area	~260	☒	☒	☒	☒		☒				☒					☒			☒	☒													☒					☒	☒			☒	☒	☒				☒	☒
Indian Fishery		☒	☒	☒	☒		☒							☒			☒		☒	☒							☒			☒			☒					☒	☒			☒	☒			☒			
Irvine Finch River Access		☒	☒	☒	☒	☒	☒			1			☒		☒		☒		☒		6 N/R				☒	☒	☒		☒		☒							☒	☒			☒	☒			☒		☒	☒
Pine Creek Landing		☒	☒	☒	☒		☒			1				☒	☒					☒							☒			☒			☒					☒				☒	☒				☒		
Colusa-Sacramento River SRA	67	☒	☒	☒	☒	☒	☒			1			☒		☒		☒	☒	☒		14/R		☒		☒	☒	☒		☒	☒	☒				☒	☒		☒	☒			☒	☒						
Woodson Bridge SRA	470	☒	☒	☒	☒	☒	☒						☒				☒		☒		35/R		☒		☒	☒	☒		☒	☒	☒				☒	☒		☒	☒			☒	☒						

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Table 21-6A
Recreation Sites and Amenities on the Sacramento River from Red Bluff to Colusa

		Access			Site Amenities and Uses																																						Site Characteristics						
		Mode of Access			Facility Signage				Boating Facilities				On-Site Parking				Pedestrian Access			Overnighting (R=Reservable/ NR=Non-Reservable)					Water		Picnic Sites				Toilet Facilities				Other Amenities		Recreation Uses						Shore Characteristics						
Site Name	Acres	Public Use Allowed	Public Road	River	Entrance	Directional	Facility Rules	Services	Marina	Ramp(s)	Carry-in	Boat Dock/Landing	Asphalt Lot	Gravel Lot	Boat Trailer Parking	Dirt Lot	ADA Accessible	Paved Walks	Unpaved Walks/Trails	Tent sites	Tent/Trailer Sites	RV Sites	Group Camps	Cabins	Potable Water	Drinking Fountains	Picnic Tables	Picnic Shelters	BBQ Grills/Pits	Informal/Tree Shaded	Flush Toilets & Sinks	Pit/Chemical Toilets	Porta-potties	None	Showers	Public Phones	Store/Bar/Restaurant	Fishing	Hiking	Hunting	Passive Recreation	Wildlife Observation	Steep/Cut Embankment	Sandy Beach	Grassy/tule	Shrubby	Undercut	Overhanging Shrubs	Overhanging Trees
Department of Fish and Game																																																	
Sacramento River Wildlife Area																																																	
Beehive Bend	216	☒																		☒														☒				☒	☒	☒	☒	☒		☒					
Colusa Unit North	119	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
Colusa Unit South	45	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
Dicus Slough Unit	1712	☒		☒																☒														☒				☒	☒	☒	☒	☒		☒					
Jacinto Unit	283	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
Merrill's Landing Unit	172	☒	☒	☒																☒														☒				☒	☒	☒	☒	☒		☒					
Moulton Unit North	106	☒		☒																☒														☒				☒				☒	☒						
Moulton Unit South	131	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					☒

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Table 21-6B
Recreation Sites and Amenities on the Sacramento River from Red Bluff to Colusa

River Mile #	Site Name	Acres	Access			Site Amenities & Uses																																						Site Characteristics						
			Mode of Access			Facility Signage				Boating Facilities				On-Site Parking				Pedestrian Access			Overnighting (R=Reservable/ NR=Non-Reservable)					Water		Picnic Sites				Toilet Facilities				Other Amenities		Recreation Uses						Shore Characteristics						
			Public Use Allowed	Public Road	River	Entrance	Directional	Facility Rules	Services	Marina	Ramp(s)	Carry-in	Boat Dock/Landing	Asphalt Lot	Gravel Lot	Boat Trailer Parking	Dirt Lot	ADA Accessible	Paved Walks	Unpaved Walks/Trails	Tent sites	Tent/Trailer Sites	RV Sites	Group Camps	Cabins	Potable Water	Drinking Fountains	Picnic Tables	Picnic Shelters	BBQ Grills/Pits	Informal/Tree Shaded	Flush Toilets & Sinks	Pit/Chemical Toilets	Porta-potties	None	Showers	Public Phones	Store/Bar/Restaurant	Fishing	Hiking	Hunting	Passive Recreation	Wildlife Observation	Steep/Cut Embankment	Sandy Beach	Grassy/tule	Shrubby	Undercut	Overhanging Shrubs	Overhanging Trees
182.5	Ord Bend Unit	112	☒	☒	☒	☒	☒	☒				☒		☒	☒	☒	☒	☒	☒	☒	☒			☒	☒	☒	☒	☒	☒	☒	☒	☒		☒	☒	☒	☒		☒	☒	☒	☒	☒	☒	☒		☒	☒		
174.5	Oxbow Unit	94	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒						
194-8	Pine Creek Unit	1060	☒		☒																☒														☒				☒	☒	☒	☒	☒		☒					
163	Princeton Unit North	551	☒	☒	☒												☒				☒														☒				☒	☒	☒	☒	☒	☒	☒					
164	Princeton Unit East		☒	☒	☒																☒														☒				☒	☒	☒	☒	☒	☒						
162	Princeton Unit South	150	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
187	Shannon Slough Unit	150	☒	☒	☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
159	Stegemen Unit	154	☒		☒																☒														☒				☒	☒	☒	☒	☒	☒	☒					
202-5	Wilson's Landing Unit	285	☒		☒																☒														☒				☒	☒	☒	☒	☒		☒		☒			
Reclamation Board																																																		
146.2	Beach at SRWA Colusa Unit	50+/-			☒																																		☒						☒					
145.9	Cobb's Bend (island)	35+/-			☒																																		☒						☒					
145.5	Cruise n' Tarry Marina	22.2	☒	☒	☒							☒					☒																						☒					☒	☒					
190	Sam's Slough	70.2																																					☒					☒						
196	Site near Pine Creek Landing	~50			☒																																													
196	Site 86F (in SWRA Pine Creek)	~25			☒																																								☒					
192.5	Site 32F (Instr. #960756)	33.7																																					☒						☒					
191	Sacramento River Parcel	33.3			☒																																							☒						
178.2	Site 85F (B808 P72 S 43)	73.3			☒																																		☒					☒						
172	Site 86F	29			☒																																		☒						☒					
	Site 78 (B795 P140 S67)	122																																																
	Site 79F (B807 P293 S67)	36																																																
170.5	Site 86F (B807 P293 S67)	29			☒																																		☒						☒		☒			
170	Site 79F (B795 P135 S67)	122			☒																																		☒						☒		☒			
State Lands Commission																																																		
221	Kopta Slough		☒	☒	☒	☒	☒	☒			☒	☒		☒	☒	☒	☒	☒	☒	☒	☒			☒	☒	☒	☒	☒	☒	☒	☒	☒		☒	☒	☒	☒		☒	☒	☒	☒	☒	☒	☒		☒	☒		
County and City Public Facilities																																																		
City of Colusa																																																		
144	Colusa Levee Scenic Park	2.19	☒	☒	☒	☒		☒											☒		☒						☒	☒		☒	☒								☒				☒	☒			☒			
	Glenn County																																																	
169	Butte City Launch Facilities	2	☒	☒		☒	☒	☒			☒			☒													☒	☒						☒					☒					☒			☒			
184	Ordbend Park	12	☒	☒	☒	☒	☒	☒			☒			☒					☒								☒	☒		☒		☒							☒				☒	☒			☒			
	Tehama County																																																	
229.5	Mill Creek Park Launching Facility		☒	☒	☒	☒					☒			☒												☒	☒	☒				☒		☒																
231.5	North Mill Creek Fishing Access		☒	☒	☒												☒			☒	☒											☒				☒														
218	Tehama County River Park		☒	☒	☒	☒					☒			☒				☒	☒		☒					☒	☒	☒	☒	☒	☒	☒													☒					

PRELIMINARY – SUBJECT TO CHANGE

Table 21-6B
Recreation Sites and Amenities on the Sacramento River from Red Bluff to Colusa

			Access			Site Amenities & Uses																																						Site Characteristics						
			Mode of Access			Facility Signage				Boating Facilities				On-Site Parking				Pedestrian Access			Overnighting (R=Reservable/ NR=Non-Reservable)					Water		Picnic Sites				Toilet Facilities				Other Amenities		Recreation Uses						Shore Characteristics						
River Mile #	Site Name	Acres	Public Use Allowed	Public Road	River	Entrance	Directional	Facility Rules	Services	Marina	Ramp(s)	Carry-in	Boat Dock/Landing	Asphalt Lot	Gravel Lot	Boat Trailer Parking	Dirt Lot	ADA Accessible	Paved Walks	Unpaved Walks/Trails	Tent sites	Tent/Trailer Sites	RV Sites	Group Camps	Cabins	Potable Water	Drinking Fountains	Picnic Tables	Picnic Shelters	BBQ Grills/Pits	Informal/Tree Shaded	Flush Toilets & Sinks	Pit/Chemical Toilets	Porta-potties	None	Showers	Public Phones	Store/Bar/Restaurant	Fishing	Hiking	Hunting	Passive Recreation	Wildlife Observation	Steep/Cut Embankment	Sandy Beach	Grassy/tule	Shrubby	Undercut	Overhanging Shrubs	Overhanging Trees
Private Facilities																																																		
The Nature Conservancy																																																		
197	Bratten	83																																																
197	Gunhill	58																																									⊠						
197	Kaplan	102																																									⊠						
199	Harley	103		⊠																																													
194	Rx Ranch	236		⊠																																													
199	Sunset Ranch	111		⊠	⊠																																												
198	Vereschagen	177		⊠	⊠																																						⊠						
145-6	Ward	238			⊠																																						⊠	⊠					
Private																																																		
142	Bert's Steelhead Marina	~1	⊠	⊠	⊠	⊠							⊠	⊠							⊠		⊠			⊠		⊠				⊠						⊠						⊠			⊠			
229.5	Driftwood RV Fishing Resort	~6	⊠	⊠	⊠	⊠							⊠		⊠						⊠		⊠	⊠		⊠		⊠				⊠				⊠							⊠	⊠			⊠			
229.7	Hidden Harbor Marina & RV Park	8.86	⊠	⊠	⊠	⊠				⊠	⊠		⊠			⊠					⊠		⊠			⊠		⊠				⊠						⊠					⊠	⊠			⊠			
235	Hunter's Resort	~12	⊠	⊠	⊠	⊠				⊠	⊠		⊠			⊠					⊠		⊠			⊠		⊠															⊠	⊠			⊠			
229.5	River's Rest Resort	~2	⊠	⊠	⊠	⊠							⊠		⊠						⊠		⊠			⊠		⊠				⊠											⊠	⊠			⊠			
196.5	Scotty's Boat Landing (lease)	~2	⊠	⊠	⊠	⊠					⊠					⊠	⊠				⊠		⊠			⊠		⊠				⊠					⊠	⊠						⊠	⊠					
218	Woodson Bridge RV Park	~12	⊠	⊠	⊠	⊠							⊠		⊠	⊠					⊠	⊠	⊠	?		⊠		⊠		⊠		⊠				⊠	⊠	⊠					⊠	⊠	⊠					

Source, EDAW, 2003.

Lake Oroville State Recreation Area

Lake Oroville SRA includes Lake Oroville, the second largest storage reservoir in California, and much of the Thermalito Complex, which are owned and operated by DWR as part of the SWP. Recreation resources at Lake Oroville SRA include boating, fishing, fully developed and primitive camping, picnicking, swimming, horseback riding, mountain biking, wildlife watching, and hunting. Lake Oroville has two full-service marinas, numerous boat ramps, 10 floating campsites, 84 boat-in campsites, and seven two-stall floating toilets (DWR, 2004). The Oroville WA contains the surface of the Thermalito Afterbay and surrounding lands, and some lands adjacent to the Feather River. Recreation activities include boating, waterskiing, hunting, fishing, wildlife viewing, camping, and picnicking.

Lake Oroville has five public boat ramps with two lanes or more, a DWR service ramp, and five one-lane cartop boat ramps (Table 21-7). Four of the cartop ramps are shallow, reaching only to elevations between 825 and 866 feet. Foreman Creek Ramp is much deeper, extending to 730 feet, as does the DWR Service Ramp. The five major public boat ramps (Loafer Creek, Enterprise, Lime Saddle, Spillway, and Bidwell Canyon) launch most of the recreational boats on Lake Oroville. A day-use area and Aquatic Center are popular at Thermalito Forebay. These Lake Oroville SRA recreational facilities are managed by California Department of Parks and Recreation, which has entered into a contract with the Feather River Recreation and Park District for Aquatic Center operation. No motorized boating is allowed at the North Forebay area, but personal watercraft use is popular at South Forebay.

Table 21-7
Lake Oroville Boat Ramp Bottom Elevations

	Elevation (Feet)	Feet Below MNWS	Boat Ramp Lanes
Stringtown Cartop	866	34	1
Dark Canyon Cartop	851	49	1
Vinton Gulch Cartop	848	52	1
Nelson Bar Cartop	825	75	1
Loafer Creek	775	125	2 to 8
Enterprise	750	150	2
Foreman Creek Cartop	730	170	1
DWR Service Ramp	730	170	2
Lime Saddle	702	198	2 to 4
Spillway	695	205	2 to 12
Bidwell Canyon	675	227	2 to 7

Note:
Maximum Normal Water Surface (MNWS) elevation occurs at 900 feet.
Source: DWR, 2004; Dossey, pers. comm., 2012; Rischbieter, pers. comm., 2011.

Stony Gorge Reservoir

Stony Gorge Reservoir is located approximately 23 miles west of Willows and upstream of Black Butte Lake on Stony Creek. Its primary purpose is to provide irrigation water, but there is one recreation area on the north end of the reservoir. Use declines in the latter half of summer and fall as the water level declines. There are primitive campsites for tents and recreational vehicles, and one reservable pay-for-use group campsite. No hunting or off-road vehicle use is permitted. Some permanent restrooms are available. There is one single-lane concrete boat ramp at Stony Gorge that is available year-round (Dirksen and Dirksen, 2003).

Feather River

Downstream of Lake Oroville, the Feather River passes through the Oroville WA and several towns before joining the Sacramento River at Verona. The most popular recreation area is Riverfront Park near Marysville. Facilities include picnic areas, restrooms, nearby campgrounds and lodging, and a boat ramp. Verona Marina, located at the mouth of the Feather River, has a boat ramp which is used primarily by boat anglers. Recreation activities on the Feather River downstream of Lake Oroville include boating, fishing, camping, picnicking, swimming, wildlife viewing, and hunting. Several miles of the river near the City of Oroville are popular for bank fishing, and boat anglers frequent the lower river. Recreational facilities include public and private launch ramps, camp and day-use facilities, and trails (Stienstra, 2004).

New Bullard's Bar Reservoir

New Bullard's Bar Reservoir is located on the Yuba River in the Tahoe and Plumas national forests in Yuba County. Popular recreation activities include waterskiing, wakeboarding, houseboating, wildlife viewing, power boating, non-motorized boating, fishing, hiking, mountain biking, and camping. The Yuba County Water Agency and the USFS maintain 30 boat access camps and lakeside camping. Emerald Cove Marina is a full-service facility offering rental houseboats and fishing boats along with moorings for private houseboats (YCWA, 2010).

East Park Reservoir

East Park Reservoir is located approximately 20 miles west of Maxwell in the Stony Creek watershed. The reservoir is located between the towns of Lodoga and Stonyford and 10 miles south of Stony Gorge Reservoir. There are areas on the west and east shores of the reservoir that are developed for recreation. Although there are no concrete boat ramps, there are two designated and six informal boat launch sites on the lake (Hinton and Campbell, 2003). There are no formally defined campsites or user fees at East Park except for three reservable fee group campsites: Chisholm Cove Group Camp, Hole in the Wall, and Coyote Cove. Camping areas are user defined and are located near the water's edge. There are approximately 44 acres of camping area available to the public at East Park (Tetra Tech, 2004).

Englebright Reservoir

Englebright Reservoir is located in the Sierra Nevada foothills approximately 21 miles east of Marysville. Recreation opportunities include boat-in camping, fishing, a marina, a store, and a café. Boats can be launched near the dam or at Joe Miller Recreation Area. A variety of rental boats are available at Skippers Cove (Dean's AnglerNet.com, 2011).

Indian Valley Reservoir

Indian Valley Reservoir, including the Cache Creek Recreation Area, is located on the North Fork of Cache Creek in Lake County, and is operated by the Yolo County Flood Control & Water Conservation District. It is located in a secluded area of the Coast Range and is surrounded by public land managed by the BLM. There are four designated recreation areas, which include a marina and unimproved and primitive campsites. Boating speed is limited to 10 mph, and waterskiing and jetskis are prohibited (Rischbieter and Elkins, 2000; FishersNet.com, 2011).

Clear Lake

Clear Lake provides many year-round recreation resources including fishing, boating, sailing, swimming, and waterskiing. There are eight county parks, two State parks, and three city parks located on the lake's perimeter, with 11 no-fee public boat ramps. There are also many private resorts and marinas. Clear Lake hosts many bass fishing tournaments. Because of Clear Lake's elevated mercury levels, a health advisory is in effect for consumption of fish caught in the lake (Stienstra, 2004; Dirksen and Dirksen, 2003).

Folsom Lake State Recreation Area and Lake Natoma

Folsom Lake and Lake Natoma are owned by Reclamation, and recreation is managed through an agreement with the California Department of Parks and Recreation. Folsom Lake is located east of the City of Sacramento and extends to the north and south forks of the American River. Recreation resources include boating, camping, fishing, picnicking, and an extensive trail system. The trail system connects to the American River Parkway, a 6,000-acre open corridor that connects trails and parks throughout the City of Sacramento. Facilities at Folsom Lake include two major campgrounds and multi-stage boat ramps to provide continuous boating under fluctuating water level conditions (Rischbieter, 2001).

Folsom Lake has eight major boat ramps with two or more lanes and two one-lane ramps more suitable for cartop boats (Table 21-8). Both one-lane ramps are relatively shallow ramps, and Bigger's Cove ramp is out of the water by the end of September every year. Some of the ramps are not available until the lake elevation is 18 to 58 feet below the normal maximum water surface elevation.

Table 21-8
Folsom Lake Boat Ramp Bottom Elevations

	Elevation (Feet)	Feet Below MNWS	Boat Ramp Lanes
Bigger's Cove (Peninsula North)	434	34	1
New Stage Four (Granite Bay)	425	43	4
Rattlesnake Bar	425	43	2
Peninsula South	410	58	1
5 percent Ramp (Granite Bay)	408	60	4
Folsom Point (Old Dyke 8)	406	62	4
Old Stage One to Four[a] (Granite Bay)	395	73	2-10
Folsom Lake Marina (Brown's Ravine)	395	73	4
Hobie Cove[b] (Brown's Ravine)	375	93	4
Low Water Ramp[c] (Granite Bay)	370	98	2

[a]Stage Three boat ramp (10 lanes) starts at elevation 450 feet, Stage two (10 lanes) starts at elevation 435 feet, and Stage One (2 lanes) starts at elevation 420 feet.
[b]Hobie Cove boat ramp starts at elevation 426 feet.
[c]Low Water ramp starts at elevation 410 feet.

Note:
Maximum Normal Water Surface (MNWS) elevation occurs at 468 feet.

Source: Moses, pers. comm., 2011.

Lake Natoma is the regulating reservoir for Folsom Lake. The water is very cold and lake levels can fluctuate three or four feet per day. This narrow lake has approximately 500 surface acres, with 13 miles of shoreline. The lake covers old dredge tailings, which create good fish habitat, but can be a boating hazard. Waterskiing is prohibited and a five-mile-per-hour speed limit is enforced. Boats with small motors, canoes, kayaks, inflatables, sail boats, and sail-boards are permitted. There are three group camps and a boat ramp at Negro Bar. The California State University Sacramento Aquatic Center near Nimbus Dam has a boat ramp and offers rentals and lessons for aquatic sports (Stienstra, 2004).

American River

The lower American River flows for 23 miles downstream of Lake Natoma and Folsom Dam through the greater Sacramento urban area. Recreation activities include recreational boating, rafting, kayaking, fishing, swimming, and wading. The river passes through the American River Parkway. This heavily used parkway is a paved bike, walking, running, hiking, and equestrian trail that extends from Lake Natoma to Discovery Park. The American River Parkway provides a greenbelt for several communities and experiences over one million visitors annually. There are more than a dozen public access points or parks along the trail. This is a Class 1 rafting river (with three Class II rapids) and is used heavily from Memorial Day weekend to Labor Day. Fishing is also popular in this reach (Stienstra, 2004). The 23 miles of the lower American River from Nimbus Dam to the confluence with the Sacramento River is designated "recreational" in the State and federal Wild and Scenic Rivers System (NWSRS, 2013).

Lake Berryessa

Lake Berryessa, which is directly managed by Reclamation, is the largest reservoir in the eastern foothills of the Coast Range. Its primary purposes are water supply, hydroelectric power, and recreation. Located near major metropolitan areas (Sacramento and the San Francisco Bay Area) and known for excellent year-round fishing, it is one of northern California's more popular lakes. There are several public access areas along the western shoreline for day use, one boat ramp, and several recreation areas operated by concessionaires who have contracts with Reclamation. These resorts and marinas provide camping, boat launching, moorage, day use, and marina services (Dirksen and Dirksen, 2003).

Wildlife Refuges and Wildlife Areas

There is a complex of federal and State wildlife refuges in the Sacramento Valley along the Sacramento River that provides fishing, hunting, and wildlife viewing opportunities via auto tours and trails. Hunting is generally limited to upland game and waterfowl. These refuges include the Sacramento, Colusa, Sutter, and Delevan NWRs and Gray Lodge Wildlife Management Area. Gray Lodge is considered the most popular of the five refuges in the region. Fishing and hunting account for approximately 50 percent of the total use. The remaining 50 percent is devoted to hiking and photography. Recreational opportunities at the Colusa NWR include hunting, hiking, wildlife viewing, auto tour routes, and environmental education. The Sacramento NWR is headquarters for the Sacramento Valley Refuge Complex and contains a visitor center. At the Delevan NWR, hunting is allowed and a photo blind is available (CALFED, 2000).

Sutter and Yolo Bypasses

The Sutter Bypass includes the Sutter NWR, part of the larger Sutter Bypass WA. Hunting, fishing, bird watching, photography, and general nature observation are primary recreation activities. Fishing occurs year-round (DFG, 2011a).

The Yolo Bypass includes the 1,461-acre Fremont Weir WA. Although there are no formal facilities in this WA, recreationists fish, bird watch, and view wildlife. Hunting is allowed during spring turkey season and also daily from July 1 through January 31.

The Yolo Bypass also includes the Sacramento Bypass WA. The Sacramento Bypass WA is located along the Sacramento River Deep Water Ship Channel downstream of the City of Sacramento. It is a major public waterfowl and pheasant hunting area, with several duck blinds and parking areas. There are also picnic facilities and trails. This 360-acre area provides fishing and wildlife and bird watching. Hunting is allowed from September 1 to January 31. Fishing occurs at the East Toe Drain and along lower Putah Creek (EDAW, 2010).

Sacramento–San Joaquin Delta, San Francisco Bay, Suisun Bay, and San Pablo Bay

The Sacramento-San Joaquin Delta includes the legal Delta and the Sacramento River from Colusa to the Delta. It is the largest estuary on the west coast and provides more than 500 miles of navigable waterways. Most of the recreation in the Delta is water-dependent or water-enhanced. Although boating and fishing are the most popular activities, people also engage in camping, picnicking, hiking, bicycling, hunting, and wildlife viewing.

San Francisco Bay is used heavily for sailing. Yachting and yacht racing are also popular activities. A bicycle and pedestrian trail circles the shoreline of the bay along with many parks and natural areas.

Suisun Bay is a shallow tidal estuary that provides fishing opportunities year-round. Boat access is available at three marinas, and camping sites for motor homes or trailers are available at the Benicia State Recreation Area. Suisun Bay is surrounded by Suisun Marsh, which is the largest brackish marsh on the west coast and includes 116,000 acres of wetlands. It contains public waterfowl hunting areas and 158 private duck clubs. The marsh’s open space and proximity to major urban areas make it well-suited for wildlife viewing, hiking, canoeing, as well as hunting (DWR, 2011).

San Pablo Bay is a tidal estuary that forms the northern extension of San Francisco Bay. Because of its large size and shallow waters, San Pablo Bay frequently has difficult conditions for boating. Prevailing winds produce large waves and there are few protected areas for most boats. The San Pablo Bay NWR and the Napa-Sonoma Marshes WA are located along the Napa River estuary on the north shore of the bay. Most of the area is accessible to the public by boat only. However, there is enough vehicle access that the area is regularly used by hunters and anglers, as well as bird watchers, photographers, bicyclists, and hikers (USFWS, 2011; DFG, 2011b).

21.2.4 Primary Study Area

21.2.4.1 Recreation Resources, Use, and Capacity

This section describes the existing recreation resources in the Primary Study Area, which includes the footprints of the Project facilities, as well as the construction disturbance area around those proposed facilities.

All Primary Study Area Project Facilities

Most of the Project facility sites are privately owned[5], with no public access. However, the private landowners within Antelope Valley, their guests, and their employees may participate in recreational activities, such as hunting upland game birds, deer, and wild boar, as well as firearm target practice, hiking and picnicking, off-road vehicle use, and primitive camping. Occasional horseback riding has also been observed. Fishing is an infrequent activity because of the intermittent nature of the streams in Antelope Valley; children have been observed fishing in Stone Corral Creek located downstream of the

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[5] The following proposed Project facility sites are privately owned: Sites Reservoir and Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, and GCID Canal Connection to the TRR.

proposed Sites Dam site. There are several stock ponds located throughout the proposed Sites Reservoir footprint, and some are large enough to support warmwater fishes; it is not known, however, if these ponds are used for recreational fishing. Estimated recreation use within Antelope Valley is approximately 300 hours annually (Rischbieter and Elkins, 2000; Reclamation, 2012).

Existing recreation activities that occur along the proposed Delevan Pipeline and Delevan Transmission Line alignments are associated with private hunting and fishing clubs; the duck hunting clubs experience high use levels.

The proposed location of the Delevan Pipeline Intake/Discharge facilities, which includes a portion of the bank of the Sacramento River, is currently used for shore fishing, but use is limited because the shore can only be accessed from private land. In addition, the river is used for activities such as boating and boat fishing at this location.

The GCID Canal, facilities, and lateral bank roads are for the use of authorized personnel only. The use of the GCID Canal, facilities and roads for public recreation or other unauthorized activity is prohibited.

Limited recreation activities occur on private lands within the proposed construction disturbance areas for the proposed new roads. Existing county roads are used by the public for access to the local area, including existing reservoirs and the Mendocino National Forest.

The existing Funks Reservoir and the land surrounding the reservoir are owned by Reclamation. Opportunities for public recreation at Funks Reservoir do not exist because the maintenance roads leading into and around it are closed to the public.

21.3 Environmental Impacts/Environmental Consequences

21.3.1 Regulatory Setting

Recreation resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

21.3.1.1 Federal Plans, Policies, and Regulations

- Management Guide for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area
- Federal Water Project Recreation Act of 1965
- Rehabilitation Act of 1973
- Architectural Barriers Act of 1968
- Americans with Disabilities Act of 1990, as Amended
- San Luis Authorization Act

21.3.1.2 State Plans, Policies, and Regulations

- Davis-Dolwig Act of 1961 and State Water Code Section 11900-11901
- California Public Trust Doctrine
- Folsom Lake State Recreation Area General Plan and Amendment

- Lake Oroville State Recreation Area Resource Management Plan and General Development Plan and Amendment
- San Luis Reservoir State Recreation Area General Development Plan and Amendment

21.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

21.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for recreation resources:

- Would the Project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?
- Does the Project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Require the construction or expansion of existing recreational facilities, which may have an adverse physical effect on the environment.
- Reduce recreation use levels at existing recreational facilities by providing an alternative new site for recreation visitors.
- Reduce recreation use levels and/or recreation benefits at existing reservoirs or rivers due to changes in operating criteria (significant impacts would be triggered by the loss of use for one month for the lowest boat ramp and two months for intermediate[6] boat ramps over the 82-year period of record within the primary recreation season.; in addition, a one point reduction or more in the recreation-day benefit value for reservoir operation would be considered a significant impact.)
- Reduce recreation use levels at existing recreational facilities during the Project construction period.
- Create hazardous conditions for water-based activities due to changes in operating criteria.

[6] Intermediate boat ramps are all major boat ramps other than the lowest boat ramp.

21.3.3 Impact Assessment Assumptions and Methodology

21.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to recreation resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge facilities would be required.
- The extension of the Bidwell Canyon boat ramp at Lake Oroville that is planned for in the FERC License Renewal Project, which is a project included in the No Project/No Action Alternative, would be implemented.

21.3.3.2 Methodology

Potential impacts to recreation resources were evaluated for the proposed Sites Reservoir and five major reservoirs that would potentially be affected by Project operations (Trinity, Shasta, Oroville, Folsom, and San Luis). End-of-month water surface elevations for each of these reservoirs were evaluated to determine if changes in operation would result in adverse effects to the aesthetic quality of the reservoirs, or would result in reduced availability of boat ramps. The methods used to evaluate these effects are described below.

Recreation-Day Benefit Value for Reservoir Operation

Recreation-day benefit values for reservoirs are based on guidelines described in DWR's Economics and Recreation Planning Manuals and in Supplementary Procedures for Application of Department of Water

Resources Guidelines for Evaluation of General Recreation, developed jointly by the Departments of Parks and Recreation and DWR (California State Parks, 1967).

These guidelines are intended to express the net benefit of a reservoir to a recreationist in terms of two equally weighted factors: (1) variety and quality of recreation, and (2) aesthetic qualities of the site. Factors considered in determining the variety and quality of recreation at a reservoir include the types of activities available, quality of the experience, quality of development, and operation and maintenance of the facilities and area. Aesthetic factors include reservoir operation, geologic, topographic, aquatic, vegetative, climate, and other environmental factors.

For the purposes of this analysis, only the reservoir operation portion of the recreation-day benefit value was evaluated. Reservoir operations were assigned up to 50 points; in general, a full reservoir with no water level fluctuations during the recreation season would receive 50 points, and a reservoir that experiences severe water level fluctuations or drawdowns during the recreation season would receive few points.

Specifically, CALSIM II modeling results (Appendix 6B) were used to obtain the long-term average end of month surface area during the primary recreation season (May 1 through September 30), for each reservoir, for Existing Conditions, the No Project/No Action Alternative, and for each action alternative. Because modeling results represent end-of-month values, results for April through September were analyzed to represent the primary recreation season.

The average end of month surface area was calculated for April through September, and then divided by the maximum normal water elevation surface area of the reservoir to obtain a ratio of average surface area to normal pool surface area. The calculated ratio was compared to a Project Operations –Reservoir Point Rating Graph (California State Parks, 1967) to obtain the associated operation points portion of the recreation-day benefit value. The operation point value was then rounded to the nearest half point (Appendix 21A). A one point reduction or more in the recreation-day benefit value for reservoir operation resulting from changes in reservoir operations was considered a potentially significant impact.

Boat Ramp Availability

CALSIM II modeling results (Appendix 6B) were used to obtain the average end of month water elevations for the reservoirs that could be affected by Project operations. The entire 82-year period of record equates to 984 months; for the purposes of this analysis, only the primary recreation season was evaluated, which includes 492 months of the entire period of record. To analyze the potential impact of changes in reservoir operations on the availability of major boat ramps, average end-of-month reservoir elevations during the primary recreation season were compared to the bottom elevations of the boat ramps (i.e., the elevation when a boat ramp is no longer usable) to determine the number of months that each boat ramp would be dewatered for Existing Conditions and for each of the alternatives (Appendix 21B). Major boat ramps are defined as having two lanes or more; cartop boat ramps and service ramps were not evaluated. The major boat ramps evaluated included the following:

- San Luis Reservoir: Dinosaur Point, Basalt
- Trinity Lake: Stuart Fork, Clark Springs, Bowerman, Fairview, Trinity Center, Cedar Stock, Minersville
- Lake Shasta: Bailey Cove, Antlers, Hirz Bay, Packers Bay, Silverthorn Marina, Digger Bay Marina, Sugarloaf, Bridge Bay Resort, Centimudi, Jones Valley

- Lake Oroville: Loafer Creek, Enterprise, Lime Saddle, Spillway, Bidwell Canyon
- Folsom Lake: Rattlesnake Bar, New Stage Four (Granite Bay), Five Percent (Granite Bay), Folsom Point (Old Dyke 8), Folsom Lake Marina (Brown's Ravine), Old Stage One to Four (Granite Bay), Hobie Cove (Brown's Ravine), Low Water (Granite Bay)
- Proposed Sites Reservoir: Stone Corral, Unnamed

It should be noted that this method of evaluation does not provide the exact number of months or days the boat ramps would be dewatered because six end-of-month estimates of average reservoir elevation are required to define the May 1 to September 30 period. Water levels could reach the bottom of a boat ramp any time during the month, but modeling results only provide elevation information for the end of each month.

21.3.4 Topics Eliminated from Further Analytical Consideration

There is no recreational use directly associated with agricultural, municipal, or industrial water use within the Extended Study Area. As described in the Affected Environment section, there is also no recreation use associated with Spring Creek. Therefore, the potential impacts to recreation use associated with these water supply uses or Spring Creek were not evaluated.

O'Neill Forebay in the Extended Study Area, as well as the regulating reservoirs that are located within the Secondary Study Area (including Lewiston Reservoir, Whiskeytown Reservoir, Keswick Reservoir, Thermalito Complex, and Lake Natoma), have also been eliminated from further consideration. As regulating afterbays, these reservoirs are operated to receive highly variable flows and, as a result, surface water elevations fluctuate significantly on a daily and hourly basis. Therefore, changes in the operation of upstream reservoirs with implementation of any of the alternatives would not affect the monthly mean elevation of these regulating reservoirs. Consequently, no assessment of potential elevation-related impacts on recreation resources in these regulating reservoirs is warranted.

The evaluation of reduced recreation use levels at existing reservoirs or rivers (**Impact Rec-4**) is not applicable to the managed wetlands of the Level 4 wildlife refuges within the Extended Study Area, and is, therefore, not discussed for those refuges.

Project construction activities would occur only with Alternatives A, B, and C at the Red Bluff Pumping Plant (located within the Secondary Study Area) and at Project facilities sites located within the Primary Study Area. Therefore, the effects of Project construction on existing recreation use levels (**Impact Rec-5**) are not discussed for any of the three study areas for the No Project/No Action Alternative, or for the Extended Study Area and the areas beyond the Red Bluff Pumping Plant within the Secondary Study Area for Alternatives A, B, and C.

The only alternative new site for recreation visitors for Alternatives A, B, and C would be Sites Reservoir. Therefore, the effects of a new recreation site on recreation use levels at existing recreational facilities (**Impact Rec-3**) are not discussed for the other proposed Project facilities within the Primary Study Area.

The defined Primary Study Area does not include any existing reservoirs that provide recreational opportunities, and does not include the Sacramento River. Impacts to recreation use levels and recreation benefits resulting from changes in operating criteria (**Impact Rec-4**) are, therefore, not discussed for the Primary Study Area. For these same reasons, hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) are not discussed for the Primary Study Area, with the exception of the Delevan

Pipeline Intake Facilities and Delevan Pipeline Discharge Facility, which would release water into the Sacramento River.

21.3.5 Impacts Associated with the No Project/No Action Alternative

21.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

San Luis Reservoir

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Project operational modeling results indicate that implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would result in the same or slightly decreased water surface elevations during most water years, and increased water surface elevations during Dry and Critical years at San Luis Reservoir. These fluctuations in San Luis Reservoir surface water elevations are not expected to affect recreation use or to increase use of existing facilities. Therefore, these changes in surface water elevations at San Luis Reservoir resulting from implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on recreation use at other existing facilities, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. Population growth could result in the increased use of existing recreational facilities such that substantial physical deterioration of the facilities would occur. Therefore, population growth associated with implementation of the No Project/No Action Alternative **could have a substantial adverse effect** on recreation use at existing facilities, when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible fluctuations in San Luis Reservoir surface water elevations would not require the construction or expansion of existing facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, there **would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

It is possible that one or more projects included in the No Project/No Action Alternative could include recreational facilities that could affect recreation use levels at San Luis Reservoir. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Population growth would not be expected to result in reduced recreation use levels. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

San Luis Reservoir surface water elevation is currently drawn down to a level that is below the bottom of the Basalt boat ramp in Above Normal, Dry, and Critical years. Implementation of the No Project/No Action Alternative would result in lower water levels than Existing Conditions in Wet, Above Normal, and Below Normal years, but would average eight feet higher in Dry years and 13 feet higher in Critical years.

Project modeling for the No Project/No Action Alternative indicates that the Dinosaur Point ramp would be dewatered more often during Wet and Below Normal years, but less often during above Normal, Dry, and Critical years over the 82-year period of record within the primary recreation season. Overall, San Luis Reservoir surface water elevations would drop below the Dinosaur Point boat ramp one month less often over the 82-year period of record within the primary recreation season than for Existing Conditions, and below the Basalt Boat Ramp three months less often over the 82-year period of record within the primary recreation season than for Existing Conditions. This decrease in the frequency of dewatering of boat ramps would be a **beneficial effect,** when compared to Existing Conditions. There are no boat-in camps or swimming beaches at San Luis Reservoir because of its existing frequent and severe drawdown pattern (as much as 40 feet in one month during a Critical year, and commonly 70 feet during the recreation season). Based on Project modeling for the No Project/No Action Alternative, the water intake at the Basalt Campground would be dewatered five fewer months over the 82-year period of record within the primary recreation season than with Existing Conditions. This would be a **beneficial effect**, when compared to Existing Conditions

Continued reservoir fluctuations associated with the No Project/No Action Alternative would result in a recreation-day benefit value for reservoir operation of 4 points, which is the same as the value for Existing Conditions. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible fluctuations in San Luis Reservoir surface water elevations would not be expected to create hazardous conditions for water-based activities. Therefore, there **would not be a substantial adverse effect,** when compared to Existing Conditions.

Other Reservoirs within the Extended Study Area

Tri-Dam Reservoirs, New Melones Reservoir, Don Pedro Reservoir, Lake McClure, Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for San Luis Reservoir. The discussion related to population growth would also apply to these other reservoirs. Recreation use at these other existing reservoirs in the Extended Study Area could be affected by implementation of the No Project/No Action Alternative because modeling results indicate that patterns of Delta exports would change and would be reduced more frequently, including by 10 percent or more during some months of Critical years. Additionally, large decreases in exports would also occur, which could potentially result in large reductions in storage during some years. Reductions in Delta exports and large reductions in reservoir storage would not be expected to result in increased use of existing recreational facilities. Implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** modeling results discussion. Decreases in storage at these other reservoirs in the Extended Study Area would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Implementation of the No Project/No Action Alternative, therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

It is possible that one or more projects included in the No Project/No Action Alternative could include recreational facilities that could affect recreation use levels at existing recreational facilities at these other existing reservoirs in the Extended Study Area. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Population growth would not be expected to result in reduced recreation use levels. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** modeling results discussion. Decreases in Delta exports and the resulting potential reductions in reservoir storage at these other existing reservoirs in the Extended Study Area could result in reduced recreation use levels and decreased recreation-day benefit values for reservoir operations. These reductions **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** modeling results discussion. Potential large reductions in reservoir storage at these other existing reservoirs in the Extended Study Area could expose submerged obstacles and create hazardous conditions for boaters and other recreationists participating in water-based activities. Reductions in reservoir storage, therefore, **would have a potentially substantial adverse effect**, when compared to Existing Conditions.

Wildlife Refuge Water Use

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for San Luis Reservoir. The discussion related to population growth would also apply to wildlife refuges. Implementation of the No Project/No Action Alternative is expected to result in a slight increase in water supplies for wildlife refuges. Increased water supplies for the managed wetlands at these refuges could result in increased recreation opportunities, and consequently, increased use of these refuges. However, the slight increase would not be expected to result in the deterioration of existing recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. The potential slight increase in recreation use at these wildlife refuges would not require the construction or expansion of the existing recreational facilities. In addition, if increased use of wildlife refuges associated with population growth resulted in the need to expand refuge facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

It is possible that one or more projects included in the No Project/No Action Alternative could include recreational facilities that could affect recreation use levels at existing recreational facilities at these wildlife refuges. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Population growth would not be expected to result in reduced recreation use levels. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. The potential slight increase in water supplies for wildlife refuges would not be expected to create hazardous conditions for water-based activities and, therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

21.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to Trinity Lake. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in negligible changes to surface water elevations at Trinity Lake. These small fluctuations would not be expected to increase use of existing recreational facilities, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes in surface water elevations would not be expected to increase recreation use, and consequently, would not require the construction or expansion of existing facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Even though only relatively small changes in operation are expected, Project modeling indicates that the No Project/No Action Alternative would reduce the total number of months that five of the Trinity Lake boat ramps would be dewatered by 40 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions. This increase in availability of these boat ramps at Trinity Lake would be a **beneficial effect,** when compared to Existing Conditions.

Project modeling also indicates that the Cedar Stock boat ramp would be dewatered the same number of months over the 82-year period of record within the primary recreation season with implementation of the No Project/No Action Alternative, when compared to Existing Conditions. This lack of change in the availability of the boat ramp **would not have a substantial adverse effect,** when compared to Existing Conditions.

The No Project/No Action Alternative would, however, dewater the Minersville ramp at the end of August during a Critical year, which, over the 82-year period of record within the primary recreation season, is two weeks sooner than with Existing Conditions. The two weeks of reduced availability does not meet the significance criteria of a one month reduction for a lowest boat ramp with implementation of the No Project/No Action Alternative, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impacts on the relatively undeveloped swimming areas at Trinity Lake would be negligible because the swimming areas are always out of the water by late summer. Access impacts to the boat-in campsites are unknown; however, with Existing Conditions, the water is always a considerable distance away from the boat-in sites by September. These negligible decreases in availability associated with implementation of the No Project/No Action Alternative therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Recreation use at Trinity Lake may increase slightly in response to the improvement in reservoir operations associated with implementation of the No Project/No Action Alternative. This improvement in operation would increase the recreation-day benefit value for reservoir operation by one point, when compared to Existing Conditions, resulting in a **beneficial effect.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes in surface water elevations would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect,** when compared to Existing Conditions.

Trinity River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Trinity River. Modeling results for Trinity River flows downstream of Lewiston Lake for the No Project/No Action Alternative, when compared to Existing Conditions, indicate only slight changes in flows during Below Normal, Dry, or Critical water years. Large decreases in flow are indicated during Wet water years, but these decreases would not occur during the primary recreation season. These slight changes in flow would not result in increased use of existing facilities, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes to the flow regime are expected during the primary recreation season, which would not be expected to result in increased recreation use, or consequently, require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of the No Project/No Action Alternative, decreases in flow are expected during Wet water years during the months of March and April (although the Trinity River Record of Decision (ROD) requirements would always be met), and increases in flows are indicated in Above Normal water years in the month of February. Large increases in flow during February could negatively affect boat and shore anglers, who are the primary recreationists at that time, and may adversely affect early season whitewater boating. However, these changes to the flow regime would not affect recreation during the primary recreation season. These changes therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions, because the previously approved and implemented ROD requirements would always be met.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes to the flow regime would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect,** when compared to Existing Conditions.

Klamath River Downstream of the Trinity River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Klamath River. Modeling results for Klamath River downstream of the Trinity River for the No Project/No Action Alternative, when compared to Existing Conditions, indicate negligible changes in flows. These negligible changes in the flow regime would not result in increased use of existing facilities, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes in the flow regime would not be expected to result in increased recreation use, and consequently, would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

River flows and levels in the Klamath River would not be changed by implementation of the No Project/No Action Alternative, so there would be no impact to its recreational uses. Changes in the Trinity River temperatures would not extend past Douglas City, and so would have no effect on the Klamath River. Therefore, implementation of the No Project/No Action Alternative, when compared to Existing Conditions, **would not have a substantial adverse effect** on recreation use levels on the Klamath River.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes in the flow regime would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect,** when compared to Existing Conditions.

Shasta Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to Shasta Lake. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in no change to surface water elevations at Shasta Lake. This lack of change would not result in increased use of existing recreational facilities, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. A lack of change in surface water elevations would not be expected to increase recreation use, and consequently, would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Project operation modeling indicates that Shasta Lake water levels associated with implementation of the No Project/No Action Alternative typically would be less than one foot higher or lower than Existing Conditions during most months of the primary recreation season. The only exception would be during August and September in Critical years, when the No Project/No Action Alternative may increase lake levels by two or three feet from Existing Conditions.

However, an evaluation of all 10 major boat ramps at Shasta Lake indicates that the No Project/No Action Alternative would dewater seven ramps several months more over the 82-year period of record within the primary recreation season than with Existing Conditions. Overall, the No Project/No Action Alternative would dewater boat ramps at Shasta Lake 30 months more than Existing Conditions over the 82-year period of record within the primary recreation season, which **would have a potentially substantial adverse effect.**

However, Bridge Bay, Centimudi, and Jones Valley (the lowest ramps) would be dewatered two months less often over the 82-year period of record within the primary recreation season than for Existing Conditions, which is considered a **beneficial effect.**

The relatively small water level changes at Shasta Lake **would not have a substantial adverse effect** on recreation use levels; the recreation-day benefit value for reservoir operation would remain unchanged at

28 points, and therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. A lack of change in surface water elevations would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Sacramento River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Sacramento River. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall negligible change to the flow regime of the Sacramento River, with the exception of decreased flows below Keswick in November during Dry years. The decreases in November would occur outside of the primary recreation season, and the other negligible changes in flow would not result in the increased use of existing recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes in the flow regime during the primary recreation season would not be expected to result in increased recreation use, and consequently, would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall minor change to the flow regime of the Sacramento River, with the exception of decreased flows downstream of Keswick Reservoir in November during Dry years. These minor changes in flows on the Sacramento River **would not have a substantial adverse effect** on recreation use levels on the river, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes in the flow regime during the primary recreation season would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Clear Creek

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to Clear Creek. Project operational modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall minor change to the flow regime of Clear Creek, with the exception of large increases in flows during Critical years. The increase in Critical year flows would benefit summer recreation along the creek and could increase use levels, but would not be expected to increase to a level that would cause the deterioration of existing facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. A potential increase in recreation use due to increased flow during Critical years would not be expected to occur at a level that would require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Project operational modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall minor change to the flow regime of Clear Creek, with the exception of large increases in flows during Critical years. The increase in Critical year flows would benefit summer recreation along the creek. This would result in a **potentially beneficial effect,** when compared to Existing Conditions**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. An overall minor change to the flow regime of Clear Creek would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Lake Oroville

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to Lake Oroville. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in slight decreases in surface water elevations at Lake Oroville. These lower water elevations would not result in the increased use of existing recreational facilities, and therefore, **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Slightly decreased surface water elevations would not be expected to result in increased recreation use, and consequently, would not require the construction or expansions of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

If the No Project/No Action Alternative is implemented, Lake Oroville surface water levels typically would be two or three feet lower during the primary recreation season, when compared to Existing Conditions. The slightly lower lake levels would have relatively minor effects on boat ramp accessibility. Overall, the No Project/No Action Alternative would increase boat ramp availability by five months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions. The No Project/No Action Alternative would increase the number of months that two of the intermediate boat ramps would be dewatered by three to four months over the 82-year period of record within the primary recreation season, which **would have a potentially substantial adverse effect,** when compared to Existing Conditions. Lime Saddle, another intermediate boat ramp that has an associated marina, would be dewatered one additional month over the 82-year period of record within the primary recreation season with implementation of the No Project/No Action Alternative. However, this additional dewatering does not meet the significance criteria of two additional months for intermediate boat ramps.

Enterprise, another intermediate boat ramp, would be dewatered one less month over the 82-year period of record within the primary recreation season with implementation of the No Project/No Action Alternative. In addition, the lowest ramp at Bidwell Canyon would be extended, with implementation of the FERC License Renewal Project included in the No Project/No Action Alternative, to a bottom elevation (640 feet) at which the ramp would always be in the water. This increased availability, especially during Critical years, would be a **beneficial effect,** when compared to Existing Conditions.

Although the lowest boat ramp at Bidwell Canyon would always be available, recreation use at Lake Oroville could be expected to decrease in response to the decreased availability of the intermediate boat ramps, especially Lime Saddle and its associated marina. Therefore, implementation of the No Project/No Action Alternative **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

The recreation-day benefit value for reservoir operation with implementation of the No Project/No Action Alternative would decrease by one point from 17.5 to 16.5 points as a result of the overall decrease in surface water levels during the recreation season. This one point reduction **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Slightly decreased surface water elevations would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Feather River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Feather River. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in many changes to the flow regime of the Feather River downstream of Thermalito, such as increased flows from June through September during most water year types, and decreases in flows during August and September in Dry years. Increased flows during the primary recreation season could result in increased use of the recreational facilities located along the Feather River, but not to a level that would result in the deterioration of those facilities. Decreased flows during Dry years could slightly reduce recreations use levels, but not to a level that would be expected to cause the increased use of other recreational facilities. Therefore, the No Project/No Action Alternative **would not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. The potential slight increases and decreases in recreation use in response to a fluctuating flow regime would not be expected to occur at a level that would require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Increased flows from June through September during most water year types and decreases in flows during August and September in Dry years could affect use levels or recreation benefits. However, flow levels would remain in an acceptable range of 1,500 to 4,000 cfs (Pike, 2001) downstream of Thermalito for fishery habitat, wading, and recreational boating, except during Below Normal, Dry, and Critical years when May flows would be between 1,000 to 1,500 cfs downstream of Thermalito and 3,000 to 5,000 cfs at Verona. During those times, the No Project/No Action Alternative conditions would be virtually the same as Existing Conditions. Therefore, the No Project/No Action Alternative **would not have a substantial adverse effect** on lower Feather River recreation use levels, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-4** discussion. Changes to the flow regime of the Feather River could create hazardous conditions for water-based activities. However, flow levels would remain in an acceptable range for wading and boating downstream of Thermalito and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Sutter Bypass and Yolo Bypass

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Sutter and Yolo bypasses. Project operational modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall small change in spills into the Sutter Bypass at Moulton, Tisdale, and Ord Ferry weirs. Colusa Weir would experience an overall decrease in spills during November, especially in Dry years. Modeling results also indicate overall small change in monthly flows into the Yolo Bypass, with the exception of large decreases in flow during late fall in Below Normal and Dry years. These changes would occur in the winter months when little or no recreation use occurs along the bypasses because of hazardous flows and poor road access. Therefore, the reduction in winter flows in the Sutter and Yolo bypasses would not impact its recreational uses and would not increase use at other recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because changes in weir spills into these bypasses would occur outside of the primary recreation season, these operational changes would not be expected to require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Because these changes in spills would occur in the winter months when little or no recreation use occurs along the bypasses, the changes **would not have a substantial adverse effect** on recreation use levels in the bypasses, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. An overall small change in spills into the Sutter and Yolo Bypass, with the exception of large decreases in flow during late fall in Below Normal and Dry years at the Yolo Bypass, would occur in the winter months when little or no recreation use occurs along the bypasses because of hazardous flows and poor road access. Small changes in spills would not be expected to create additional hazardous conditions, and decreases in flow could potentially reduce existing hazards. These expected changes in flows into the bypasses therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Folsom Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to Folsom Lake. If the No Project/No Action Alternative is implemented, decreases in surface water elevations at Folsom Lake are expected during some months of the year. These decreases could result in reduced recreation use, but these minor decreases would not result in increased use levels that would cause the deterioration of other recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. A potential reduction in recreation use levels would not require the construction or expansion of existing recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Slight decreases in surface water elevations associated with implementation of the No Project/No Action Alternative would dewater the eight major boat ramps (that have two or more lanes) at Folsom Lake a total of 29 months more over the 82-year period of record within the primary recreation season than with Existing Conditions. Most of this impact would occur at the intermediate ramps, with the dewatering occurring seven to 11 months more per boat ramp. This increased amount of dewatering **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

In addition, the lowest ramps (Hobie Cove and Low Water) would be dewatered one additional month each over the 82-year period of record within the primary recreation season. Therefore, these two boat ramps **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

Although any reduction in recreation use from modestly lower lake levels cannot be accurately quantified, it is likely to equal approximately one month of use at these ramps during the peak recreation season. The operational portion of the recreation-day benefit value for Folsom Lake would decline from 25 to 22.5 points due to the lower lake levels. These effects **would have a potentially substantial adverse effect,** when compared to Existing Conditions**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Decreases in surface water elevations at Folsom Lake could expose submerged obstacles and create hazardous conditions for water-based activities, and therefore **would have a potentially substantial adverse effect,** when compared to Existing Conditions.

American River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the American River. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall decrease in flows on the American River in all months, with the exception of December. Large decreases in flow are also indicated in September of Above Normal years, September and October of Below Normal years, and in August and September in Critically Dry years. This overall reduction in flows could result in decreased recreation use, but not at levels that would be expected to increase use of other recreational facilities or cause the deterioration of those facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. A potential decrease in recreation use would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Flows needed to support recreation uses and fishery production on the American River have been studied extensively. In general, flows of 1,500 to 3,000 cfs are acceptable for general recreation activities, and 3,000 to 5,000 cfs is desirable for boating uses during the primary recreation season (Hinton and Tittel, 1987). The No Project/No Action Alternative would generally reduce flows in the American River downstream of Nimbus Dam and at the H Street Bridge during the primary recreation season in nearly all water year types. These reductions would range from 3 percent to as much as 24 percent in August and September of Critical years at the H Street Bridge. Although streamflows would remain in the desirable ranges during most years with these reductions, flows would generally be less than 1,500 cfs during Critical years, when reductions **would have a potentially substantial adverse effect,** when compared to Existing Conditions**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. An overall decrease in flows on the American River, especially during critical years, could result in hazardous boating conditions and therefore **would have a potentially substantial adverse effect,** when compared to Existing Conditions**.**

Sacramento-San Joaquin Delta

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Sacramento-San Joaquin Delta. Project modeling indicates that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall minor change in Delta monthly outflow. This minor change would not be expected to increase use levels and cause the deterioration of recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Minor changes in Delta flow would not be expected to result in increased recreation use, and consequently, would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

The overall minor change in Delta monthly outflow associated with implementation of the No Project/No Action Alternative, when compared to Existing Conditions, would not be expected to affect recreation use levels. These minor changes would, **therefore, not have a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Minor changes in Delta flow would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect,** when compared to Existing Conditions.

Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to the Sacramento-San Joaquin Delta. Modeling results indicate that the No Project/No Action Alternative, when compared to Existing Conditions, would result in an overall negligible change in Delta monthly outflow. Therefore, Suisun, San Pablo, and San Francisco bays would also be expected to experience negligible changes. Negligible changes in the flow regime of these bays would not increase use levels or cause the deterioration of recreational facilities. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes within the bays would not be expected to result in increased recreation use, and consequently, would not require the construction or expansion of existing recreational facilities. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

The overall minor change in Delta monthly outflow and negligible changes in the flow regime of Suisun, San Pablo, and San Francisco bays **would not have a substantial adverse effect** on recreation use of the bays, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes within the bays would not be expected to create hazardous conditions for water-based activities and therefore **would not have a substantial adverse effect**, when compared to Existing Conditions.

Other Reservoirs within the Secondary Study Area

Lake Almanor, Clear Lake, Lake Berryessa, New Bullard's Bar Reservoir, Englebright Lake, Black Butte, East Park, Stony Gorge, and Indian Valley

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Refer to the **Impact Rec-1** discussion for the Extended Study Area for San Luis Reservoir. The discussion related to population growth would also apply to these other reservoirs within the Secondary Study Area. The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval as of June 2009. Some of those projects may result in indirect effects to recreation opportunities at these other reservoirs within the Secondary Study Area. However, the impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to existing recreation resources and opportunities in the vicinity of those projects has been addressed in those environmental documents. The impact on recreation resources therefore, **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. It is possible that one or more projects included in the No Project/No Action Alternative could require the construction or expansion of recreational facilities at these other Secondary Study Area reservoirs that may result in adverse effects on the environment. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. In addition, if increased use of existing recreational facilities associated with population growth resulted in the need to expand those facilities, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-3** discussion for the Extended Study Area for San Luis Reservoir. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

It is possible that other projects included in the No Project/No Action Alternative could include operations that could affect recreation use levels at the existing recreational facilities of these other Secondary Study Area reservoirs. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

It is possible that other projects included in the No Project/No Action Alternative could include operations that would affect water levels within the existing recreational facilities of these other Secondary Study Area reservoirs. However, any project being considered for implementation would be subject to CEQA and/or NEPA review and would be required to mitigate for that impact. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

21.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Population throughout California is expected to increase. Recreation use at existing neighborhood or regional parks also may (or may not) continue to increase, as described and anticipated in City and County General Plans that address areas within the Primary Study Area. However, none of the projects and programs included in the No Project/No Action Alternative are located within the Primary Study Area, and they would not directly affect existing recreation in that area. Therefore, implementation of the No Project/No Action Alternative **would not have a substantial adverse effect**, when compared to Existing Conditions.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. That discussion is also applicable to effects on the environment from the construction or expansion of existing recreational facilities.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to the **Impact Rec-1** discussion. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. That discussion is also applicable to effects on recreation use levels and/or recreation benefits at existing reservoirs or rivers.

21.3.6 Impacts Associated with Alternative A

21.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

San Luis Reservoir

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

San Luis Reservoir currently experiences severe water level fluctuations. Operational modeling results for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicate that operation of the Project would cause San Luis Reservoir water levels to continue to fluctuate, but would occur more often and could be more severe. Water level fluctuations can adversely affect recreation use levels if they occur during the recreation season. However, the water level fluctuations associated with implementation of Alternative A are expected to fall within the historic range of fluctuations during the primary recreation season and, therefore, are not expected to decrease recreation use at San Luis Reservoir or increase or substitute use at other recreational facilities. Therefore, the increased fluctuations in water levels at San Luis Reservoir resulting from implementation of Alternative A would have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Fluctuating surface water elevations would not be expected to increase recreation use at San Luis Reservoir, and consequently would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels at San Luis Reservoir because Sites Reservoir would be located approximately 200 miles from this facility. There would, therefore, be **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Changes in operation that would result in increased surface water elevation fluctuations at San Luis Reservoir associated with implementation of Alternative A would make the Dinosaur Boat Ramp available five more months over the 82-year period of record within the primary recreation season than Existing Conditions, and four more months over the 82-year period of record within the primary recreation season than with implementation of the No Project/No Action Alternative. The Basalt Boat Ramp would be usable six months over the 82-year period of record within the primary recreation season more than Existing Conditions and three months over the 82-year period of record within the primary recreation season more than with the No Project/No Action Alternative, including increased availability during Critical years. Therefore, implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, would result in a **beneficial effect.**

Implementation of Alternative A would provide sufficient water surface elevations for boating use of the reservoir; in comparison, boating access would not be possible for several months for Existing Conditions and the No Project/No Action Alternative. Recreation use at San Luis Reservoir could be expected to increase by an amount roughly equal to the five additional months over the 82-year period of record within the primary recreation season that the boat ramps would be available, which is considered a **beneficial effect,** when compared to Existing Conditions and the No Project Alternative.

The Basalt Campground water intake would be dewatered three fewer months over the 82-year period of record within the primary recreation season when compared to Existing Conditions, but two more months over the 82-year period of record within the primary recreation season when compared to the No Project/No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions, but would be a **potentially significant impact,** when compared to the No Project/No Action Alternative.

The reservoir operations portion of the recreation-day benefit value for existing San Luis Reservoir operations is approximately five out of a possible 50 points because of extensive drawdown nearly every year (averaging 138 feet). Therefore, a few feet of change in water levels with implementation of Alternative A would have only a small effect on the recreation-day benefit value for reservoir operation. Even in the Wet year conditions when the reservoir is expected to average 13 feet lower during the recreation season, or the Critical years when it could be 6 to 16 feet higher during the season, there would be a small change in the recreation-day benefit value for reservoir operation because the value is based on average conditions, rather than specific water years. The recreation-day benefit value for reservoir operation at San Luis Reservoir would be decreased by 0.5 point because the average water surface elevation would be approximately two feet lower with Alternative A than with either Existing Conditions or the No Project/No Action Alternative. This would be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Fluctuating surface water elevations at San Luis Reservoir could create hazardous conditions for water-based activities by exposing submerged obstacles or concealing obstacles that were previously visible. However, because the water level fluctuations at San Luis Reservoir are expected to fall within the historic range of fluctuations during the primary recreation season, they are not expected to create additional hazardous conditions and therefore would result in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Other Reservoirs within the Extended Study Area

Tri-Dam Reservoirs, New Melones Reservoir, Don Pedro Reservoir, Lake McClure, Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

The increased SWP/CVP exports associated with implementation of Alternative A could potentially result in increased storage at these other existing reservoirs within the Extended Study Area. Small increases in storage at these reservoirs could result in increased recreation use at these reservoirs, but the increase would be negligible and would not cause physical deterioration of existing facilities. The potential slight increases in storage at these service area reservoirs would, therefore, also not be expected to result in increased recreation use at other reservoirs. Implementation of Alternative A would, therefore, have **no impact** on increased recreation use levels at these reservoirs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Slight increases in storage could result in slightly increased recreation use levels, but not at the level that would require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels at these other existing reservoirs located within the Extended Study Area because Sites Reservoir would be located a great distance away from these facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. The potential slight increase in storage at some of these other existing reservoirs within the Extended Study Area could result in increased recreation use and an increased recreation-day benefit value if the increase occurs during the primary recreation season. The slight change in operation would, therefore, not be expected to reduce recreation use levels or other recreation benefits, and would have a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. The potential slight increase in storage at some of these other existing reservoirs within the Extended Study Area would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Wildlife Refuge Water Use

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Alternative A would provide an alternate source of Level 4 water deliveries to the wildlife refuges. The provision of an alternate source of water would have **no impact** on recreational use levels, and therefore, would not cause the deterioration of recreational facilities within the wildlife refuges, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. An alternate water supply source would not increase recreational use levels, and consequently, would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas (up to five recreation areas are proposed) are not expected to affect recreation use levels at existing wildlife refuges located within the Extended Study Area because Sites Reservoir would be located a great distance away from these facilities and would not offer the same recreational opportunities as a wildlife refuge. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. An alternate water supply source would not create hazardous conditions for water-based activities and would, therefore, have **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Operational modeling results for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicate that Alternative A would provide operational flexibility to Trinity Lake. Storage would be improved in all months of all water year types, including during May through October in Dry and Critical year conditions. In other years, larger releases would be made to stabilize fall flow conditions. Seasonal and monthly improvements in storage would occur, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, operational modeling results indicate that a reduced range of change in fluctuations would occur, resulting in less severe drawdowns. These improved conditions at Trinity Lake are not expected to increase use of existing recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Improved storage conditions are not expected to increase recreation use to a level that would require the construction of new facilities, nor would it require the expansion of the lake's existing facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels at Trinity Lake because Sites Reservoir would be located more than 130 miles away from this facility. In addition, Sites Reservoir would not provide the same recreation experiences as the larger and higher elevation, tributary-filled Trinity Lake. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative A, average end of month storage at Trinity Lake would increase during nearly all months of the year, when compared to Existing Conditions and the No Project/No Action Alternative. Improved storage could increase recreation use and/or recreation benefits, especially if boat ramps or boat-in campsites are more accessible or accessible for longer periods. There are some months in many water year types when an increase in water level of several feet would make one or more boat ramps available for longer than Existing Conditions during the recreation season.

Implementation of Alternative A would increase Trinity Lake boat ramp accessibility by a total of 87 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by a total of 47 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. However, the most important change would be in Below Normal, Dry, and Critical years, when the Cedar Stock ramp would be available six more months over the 82-year period of record within the primary recreation season than for Existing Conditions and the No Project/No Action Alternative, and the Minersville ramp would be available three more months over the 82-year period of record within the primary recreation season than for Existing Conditions and four more months over the 82-year period of record within the primary recreation season than for the No Project/No Action Alternative. These increases in boat ramp availability are considered **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

With implementation of Alternative A, boat-in campsites would be more accessible than for Existing Conditions and the No Project/No Action Alternative. There would likely be an increase in recreation use due to increased access to boat ramps and boat in-camps. The increased use would likely be equivalent to or greater than the additional four months of boating use at the Minersville Ramp. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

The reservoir operation portion of the recreation-day benefit value with Existing Conditions has a point value of 12 out of 50 possible points, and would have a value of 13 if the No Project/No Action Alternative is implemented. With implementation of Alternative A, the expected increase in water levels during the primary recreation season would increase this value to 15. Thus, the increased recreation-day benefit value for reservoir operation would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Improved storage conditions would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Trinity River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Project operational modeling results indicate that Trinity River flows would meet or exceed the Trinity River ROD requirements in all scenarios, with or without implementation of Alternative A. Modeling results show little change from the existing flow schedule, and the small amount of change would rarely occur. These occasional small changes to the existing flow schedule are not expected to affect recreation use along the Trinity River, and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Occasional small changes to the existing flow schedule are not expected to increase recreation use to a level that would require the construction or expansion of existing recreational facilities along the river. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels on the Trinity River because Sites Reservoir would be located a great distance away from this river and would not provide river recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Project operational modeling results for Alternative A show little change from the existing flow schedule, or from the No Project/No Action Alternative. Cooler water temperatures could improve conditions for anadromous fish and possibly increase Trinity River angling. Conversely, colder water temperatures in the summer months could affect water contact recreation, such as swimming or tubing. However, Project operation studies suggest the temperature change at Lewiston would be less than 1°F, except for one or two months in Critical years when it may be 2°F or 3°F colder. These minor changes in temperature would, therefore, not be likely to improve angling opportunities or adversely affect water contact recreation. This slight change in the flow regime and change in water temperature on the Trinity River would have a **less-than-significant impact** on recreation use levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Occasional small changes to the existing flow regime would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Klamath River downstream of the Trinity River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

River flows and levels in the Klamath River would not be changed by implementation of Alternative A, when compared to Existing Conditions the No Project/No Action Alternative, so there would be **no impact** to its recreational uses.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because recreational use levels would not be affected, the construction or expansion of existing recreational facilities would not be required. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels on the Klamath River because Sites Reservoir would be located approximately 300 miles away from this river and would not provide river recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. In addition, any changes in Trinity River temperatures would be negligible past Douglas City and therefore would have no effect on the Klamath River. Therefore, implementation of Alternative A would have **no impact** on recreation use levels on the Klamath River, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. A lack of change to the existing flow regime would not create hazardous conditions for water-based activities and therefore would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Shasta Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Operational modeling results for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicate that Alternative A would provide operational flexibility to Shasta Lake, similar to that described for Trinity Lake. Improved storage conditions and reduced water level fluctuations are not expected to reduce recreation use of Shasta Lake and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Improved storage conditions are not expected to increase recreation use to a level that would require the construction or expansion of existing facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels at Shasta Lake because Sites Reservoir would be located approximately 115 miles away from this facility. In addition, Sites Reservoir would not provide the same recreation experience as the larger and higher elevation, tributary-filled Shasta Lake. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

For Alternative A, storage at Shasta Lake would increase nearly every month during all water year types, when compared to Existing Conditions and the No Project/No Action Alternative.

There are no obvious major changes to boat ramp accessibility, but implementation of Alternative A would increase accessibility to several ramps in August and September during most water year types (a **beneficial effect**). In Dry years, the Antlers Ramp would go out of service in August and September (an adverse impact), but eight of the remaining major boat ramps would still be accessible. In addition, overall accessibility at Antlers Ramp would improve by 11 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by 15 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative.

In Critical years, access to Packers Bay and Digger Bay ramps would be increased by nearly one month. Access to Centimudi and Jones Valley ramps would be increased by three months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions and the No Project/No Action Alternative. Access to all major boats ramps would be improved by at least two months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions and the No Project/No Action Alternative. The exception would be the Silverthorn Marina, which would be dewatered two months more over the 82-year period of record within the primary recreation season, when compared to Existing Conditions. Overall, Shasta Lake boat ramp accessibility associated with Alternative A would increase by a total of 56 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by 86 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. When considering all of the expected changes, implementation of Alternative A would result in a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The USFS provides information on the Whiskeytown-Shasta-Trinity National Recreation Area website indicating how far it is to the water's edge from campgrounds at various water levels. Data specific to each of the 17 campgrounds located at that recreation area are not available, so a detailed analysis of the operational effect of Alternative A on those areas was not performed. However, a 20-foot increase in water level during the recreation season would shorten the distance to the lake by more than 150 feet (USFS, 2011).

In addition to slightly improved boat ramp and boat-in camp accessibility, the increased water levels at Shasta Lake associated with Alternative A would increase the lake's recreation-day benefit value. The Existing Conditions and No Project/No Action Alternative's reservoir operation portion of the benefit value both have a point value of 28 out of 50 possible points. The increase in water levels during the primary recreation season with implementation of Alternative A would increase this value to 33 points. Improved storage at Shasta Lake would have a **beneficial effect** on the recreation-day benefit value for reservoir operation, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Improved storage conditions would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Sacramento River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

The flow regime modifications on the Sacramento River expected with implementation of Alternative A would not significantly affect river recreation use and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Occasional small changes to the existing flow schedule are not expected to increase recreation use to a level that would require the construction or expansion of existing facilities along the river. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels on the Sacramento River because Sites Reservoir would not provide river recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Improved (colder) water temperatures on the Sacramento River resulting from flow regime modifications have the potential to improve conditions for salmon and steelhead, and consequently, increase fishing use on the river. Conversely, colder water temperatures in the summer months may adversely affect water contact recreation, such as swimming and tubing, which is already limited in the Sacramento River. However, Project operation modeling indicates that water temperatures at Balls Ferry, Bend Bridge, and the City of Red Bluff would be essentially unchanged, with differences always less than 1°F. Thus, changes in the flow regime of the Sacramento River would have a **less-than-significant impact** on recreation use levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Occasional small changes to the existing flow regime of the Sacramento River would not be expected to create hazardous conditions for water-based activities. Decreased water temperatures could, however, create hazardous conditions for swimmers or tubers, but these types of recreation are limited on the

Sacramento River and modeling results indicate the changes in temperature would be less than 1°F. Therefore, changes in the flow regime of the Sacramento River would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump Installation at the Red Bluff Pumping Plant

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

The installation and operation of an additional pump in an existing bay at the Red Bluff Pumping Plant would result in only minor increases in diversions from the river, when compared to Existing Conditions and the No Project/No Action Alternative. This minor change in flow would have **no impact** on recreation use levels in the Sacramento River near that location and would not increase use at other recreational facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Minor changes in the flow regime would not be expected to affect recreation use levels on the Sacramento River at this location and consequently would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

Refer to **Impact Rec-3** for the Sacramento River. That discussion is also applicable to effects on recreation use levels at existing recreational facilities.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Minor changes in the flow regime would not be expected to affect recreation use levels. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-5: Reduce Recreation Use Levels at Existing Recreational Facilities during the Project Construction Period

Construction activities associated with the installation of an additional pump at the Red Bluff Pumping Plant would not occur within the river, and therefore, would have **no impact** on recreation use levels in that area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Minor changes in the flow regime would not be expected to create hazardous conditions for water-based activities and therefore would have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Clear Creek

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Project operational modeling results indicate that Clear Creek flow requirements would be met or exceeded, if Alternative A is implemented, and that changes in Clear Creek flows and water temperatures would be minor. Minor changes in flow would have **no impact** on Clear Creek recreation use levels and would not increase use at other recreational facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Minor changes in flow would not be expected to affect recreation use levels, and consequently, would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels on Clear Creek because Sites Reservoir would be located approximately 100 miles away from this creek and would not provide the same type of recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Cooler water temperatures downstream of Whiskeytown Lake in Dry and Critical years could potentially improve conditions for anadromous fish in Clear Creek and ultimately increase Sacramento River angling. However, Project operational modeling results indicate that changes in Clear Creek flows and water temperatures would be minor, so no measureable improvement is anticipated. Therefore, there would be **no impact** on recreation use levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Minor changes in flow would not be expected to create hazardous conditions for water-based activities and therefore would have **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Lake Oroville

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Operational modeling results for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicate that Alternative A would provide operational flexibility to Lake Oroville, similar to that described for Trinity Lake. Improved storage conditions and reduced water level fluctuations are not expected to reduce recreation use at Lake Oroville and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Improved storage conditions are not expected to increase recreation use to a level that would require the construction or expansion of existing facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas could affect recreation use levels at Lake Oroville, especially if Sites Reservoir surface water elevations are high when Lake Oroville surface water elevations are low. However, Sites Reservoir would be smaller than Lake Oroville and would not provide the same recreation experience as the larger tributary-filled Lake Oroville; it, therefore, would not be expected to substantially reduce recreation use levels at Lake Oroville. Therefore, there would be **a less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

The Bidwell Canyon low water ramp would always be in the water with implementation of the No Project/No Action Alternative, and would remain in the water with or without implementation of Alternative A. Alternative A would increase access to the remaining four major ramps evaluated at Lake Oroville by 15 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by 22 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. This situation would result in a **beneficial effect** with implementation of Alternative A when compared to Existing Conditions and the No Project/No Action Alternative.

Typically, the changes in water elevations with Alternative A would not substantially change access to the boat-in campsites, when compared to Existing Conditions and the No Project/No Action Alternative, so there would be **no impact**.

The Existing Conditions operation for Lake Oroville has a recreation-day benefit value of 17.5 points. This value would not change with implementation of Alternative A. However, the operation portion of the recreation-day benefit value for the No Project/No Action Alternative is 16.5 points, so Alternative A would provide an increase of one point. Therefore, implementation of Alternative A would have **no impact** on the recreation-day benefit value when compared to Existing Conditions, and would have a **beneficial effect** when compared to the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Improved storage conditions would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Feather River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Project operational modeling results indicate that Feather River flows would meet or exceed the FERC Settlement Agreement's minimum flow requirements in all scenarios. When compared to Existing Conditions and the No Project/No Action Alternative, flows in June through September in drier years would be improved. However, flows would generally be decreased during October, November, and December. The flow regime modifications on the Feather River expected with implementation of Alternative A would not significantly affect river recreation use and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Increased flows during the recreation season during drier years are not expected to increase recreation use to a level that would require the construction or expansion of existing recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels on the Feather River, as Sites Reservoir would not provide river recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Improved flow and temperature conditions for salmon and steelhead during drier years could result in increased populations; consequently, fishing use would likely increase. Conversely, colder water temperatures in the summer months could affect water contact recreation, such as swimming or tubing. However, Project operational modeling results indicate small changes in flows and water temperatures in the lower Feather River with implementation of Alternative A, with the exception of June through September which would have relatively large increases in flow during drier years. These flow regime changes would have a **less-than-significant impact** on recreation use levels, when compared to Existing Conditions or the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Increased flows during the recreation season during drier years would fall within acceptable levels for water-based activities and would not be expected to create hazardous conditions. These flow regime changes would have a **less-than-significant impact**, when compared to Existing Conditions or the No Project/No Action Alternative.

Sutter Bypass and Yolo Bypass

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

With implementation of Alternative A, winter flood flows that spill into the Sutter Bypass would be reduced by up to 5,900 cfs due to diversions to Sites Reservoir. Flows in the Yolo Bypass would also be reduced in duration and magnitude due to Sites Reservoir diversions. However, these reductions in winter flows in the bypasses would not be expected to substantially impact its recreational uses and would not increase use at other recreational facilities. Therefore, there would be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Reductions in winter flows would not be expected to substantially affect recreation use levels and consequently would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels within the bypasses because Sites Reservoir would not provide the type of recreation opportunities that are available within the bypasses. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Reductions in winter flows would not be expected to substantially affect recreation use levels. There would, therefore, be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Reductions in winter flows in the bypasses would occur when little or no recreation use occurs because of hazardous flows and poor road access. Decreases in flow would not create hazardous conditions and could potentially reduce existing hazards. These expected changes in flows into the bypasses would, therefore, be **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. Folsom Lake

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Project operational modeling results for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicate that Alternative A would provide operational flexibility to Folsom Lake, similar to that described for Trinity Lake. Improved storage conditions and reduced water level fluctuations are not expected to reduce recreation use of Folsom Lake and would not increase use at other recreational facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Improved storage conditions are not expected to increase recreation use to a level that would require the construction or expansion of the lake's facilities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas could affect recreation use levels at Folsom Lake, especially if Sites Reservoir surface water elevations are high when Folsom Lake surface water elevations are low. However, Sites Reservoir would not provide the same recreation experiences as Folsom Lake, such as a marina and associated equipment rentals; it, therefore, would not be expected to substantially reduce recreation use levels at Folsom Lake. Therefore, there would be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Implementation of Alternative A would result in small increases in storage at Folsom Lake during some months of the year. Increased storage and resulting higher water surface elevations could slightly increase recreation use and/or the recreation-day benefit value, especially if boat ramps or boat moorage areas are more accessible.

With implementation of Alternative A, the eight major boat ramps at Folsom Lake would be available 16 additional months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 45 additional months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. The Low Water Ramp would be available three more months over the 82-year period of record within the primary recreation season than for Existing Conditions and four more months over the 82-year period of record within the primary recreation season than with the No Project/No Action Alternative. These changes would be **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

There are no designated boat-in campgrounds at Folsom Lake. However, boaters can beach their boats and camp overnight up to two nights in unoccupied campsites at Peninsula Campground. There is also a designated swimming beach. The higher water surface elevations during the recreation season resulting from implementation of Alternative A would provide slightly better access from the Peninsula and Beals Point campgrounds to the water surface, and could improve conditions at the swim beach. This would be a **potentially beneficial effect**, when compared to Existing Conditions and the No Project/No Action Alternative.

The modest increases in lake levels with implementation of Alternative A would affect the recreation-day benefit value for Folsom Lake. Existing Conditions has a value of 25 points, and the No Project/No Action Alternative would have a reservoir operation value of 22.5 points; the value would increase to 26.5 points with implementation of Alternative A. The increased recreation-day benefit value would be a **beneficial effect**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Improved storage conditions would not be expected to create hazardous conditions for water-based activities and therefore would have a **less-than-significant** impact, when compared to Existing Conditions and the No Project/No Action Alternative**.**

American River

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Operational changes on the American River related to implementation of Alternative A, when compared to Existing Conditions, would result in a substantial reduction in summer flows, but would have a flow regime similar to the No Project/No Action Alternative. Decreased or similar flows during the primary recreation season would not increase recreational use or cause the deterioration of recreational facilities along the American River. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

The operational changes associated with Alternative A would not require the construction or expansion of existing recreational facilities along the American River. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels along the American River because Sites Reservoir would not provide river recreation opportunities. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Project operational modeling results indicate that American River flows would be similar between Alternative A and the No Project/No Action Alternative, but would be significantly reduced with implementation of Alternative A, especially in Critically Dry years, when compared to Existing

Conditions (adverse impact). However, the significant flow reductions are associated with operational changes that would occur with implementation of the No Project/No Action Alternative, and were carried forward/incorporated into Alternative A. These adverse changes would occur with or without implementation of Alternative A, and are, therefore, not considered to be Project-related impacts. Because the adverse changes in flows would not be caused by implementation of Alternative A, the potential operational impacts on recreation use levels are considered to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to **Impact Rec-4** discussion. Slight changes in flow would not be expected to create hazardous conditions for water-based activities and would, therefore, be **less than significant**, when compared to the No Project/No Action Alternative. Significant flow reductions could create hazardous boating conditions, however, the significant flow reductions are associated with operational changes that would occur with implementation of the No Project/No Action Alternative, and were carried forward/incorporated into Alternative A. These adverse changes would occur with or without implementation of Alternative A, and are, therefore, not considered to be Project-related impacts. Because the adverse changes in flows would not be caused by implementation of Alternative A, the potential operational impacts are considered to be **less than significant**, when compared to Existing Conditions.

Sacramento-San Joaquin Delta and Suisun Bay

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Alternative A operations would cause minor changes in flows entering the Sacramento-San Joaquin Delta and Suisun Bay, when compared to Existing Conditions and the No Project/No Action Alternative. These changes would be too small to affect its many recreational uses and, therefore, would have **no impact** on recreation use levels.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Negligible changes in flows would not be expected to affect recreation use levels, and consequently, would not require the construction or expansion of existing recreational facilities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels within the Delta because Sites Reservoir would not provide the type of recreation opportunities that are available within the Delta. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes in flows would not be expected to affect recreation use levels. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Negligible changes in flows would not create hazardous conditions for water-based activities and would, therefore, have **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

San Pablo Bay and San Francisco Bay

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Implementation of Alternative A would not result in changes to the hydrology of San Pablo Bay or San Francisco Bay. Therefore, there would be **no impact** to recreation use levels within the bays or at other recreational facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because recreation use levels would not be affected, the construction or expansion of existing recreational facilities would not be required. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The proposed Sites Reservoir and its associated recreation areas are not expected to affect recreation use levels within the bays because Sites Reservoir would not provide the type of recreation opportunities that are available within the bays. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Because recreation use levels would not be affected, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. A lack of change in the hydrology of the bays would not create hazardous conditions and would, therefore, have **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Other Reservoirs within the Secondary Study Area

Lake Almanor, Clear Lake, Lake Berryessa, New Bullard's Bar Reservoir, Englebright Lake, Black Butte, East Park, Stony Gorge, and Indian Valley

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

No operational changes would occur at these other reservoirs within the Secondary Study Area with implementation of Alternative A. In addition, the availability of a new Sites Reservoir would not be expected to increase use of these reservoirs. Therefore, there would be **no impact** to recreation use levels at these reservoirs, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because implementation of Alternative A is not expected to affect recreation use levels at these reservoirs, construction or expansion of their existing recreational facilities would not be required. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The new availability of Sites Reservoir would not be expected to reduce recreation use levels at Lake Almanor, Lake Berryessa, New Bullard's Bar Reservoir, or Englebright Lake due to their large distance away from Sites Reservoir. However, Sites Reservoir is likely to reduce recreation use at neighboring Black Butte, East Park, Stony Gorge, and Indian Valley reservoirs, as well as Clear Lake, at least initially. Alternative A would provide a new recreation site (i.e., additional recreation opportunities) for recreation visitors. It is expected that recreationists would want to visit the new reservoir to see what it offers. Fishing in a recently filled reservoir is often outstanding for several years because a newly filled reservoir increases the biological productivity of the inundated lands; this productivity supports rapid fish growth and growth in fish populations. Publicity related to construction of the new reservoir would also create interest and would alert potential recreationists to its existence, which may attract additional visitors to the area.

Construction of a new reservoir could also cause a temporary or even permanent redistribution of recreation use among the nearby recreation sites. The factors that would determine this redistribution of use include access convenience, climate, vegetative cover, available recreation opportunities, user fees, and quality of the recreation development. Sites Reservoir would be closer to I-5 than Clear Lake or East Park, Stony Gorge, or Indian Valley reservoirs, and would be located approximately the same distance from I-5 as Black Butte Reservoir. Climate and vegetative cover are similar at all five sites. The primary differences between the reservoirs would, therefore, be the available recreation opportunities and quality of recreation development.

Sites Reservoir would be smaller than Clear Lake and much larger than the other four reservoirs, which has both positive and negative aspects. Clear Lake offers private resorts and marinas, as well as county, State, and city parks on the lake's perimeter. East Park, Stony Gorge, and Indian Valley reservoirs are minimally developed, and many of their visitors enjoy the relative freedom of movement and ability to camp or picnic more or less wherever they want. Black Butte Reservoir has designated camp and picnic sites and a paved boat ramp. In this regard, it is probably most comparable to the proposed recreation area development level at Sites Reservoir.

The large surface area of Sites Reservoir may be daunting to some boaters and appealing to others. The expected average annual 33-foot drawdown that would occur during the recreation season at Sites Reservoir with implementation of Alternative A is greater than the drawdown typical of neighboring reservoirs and could adversely affect the proposed recreation opportunities due to the increased difficulty of accessing the reservoir, the barren exposed land during the drawdown (i.e., the bathtub ring appearance), and the creation of potential boating hazards. After a few years of Project operation, the distribution of recreation use at all area reservoirs is expected to stabilize, with use of neighboring reservoirs returning to pre-Sites Reservoir levels, i.e., Existing Conditions. Therefore, the temporary redistribution of recreation use resulting from implementation of Sites Reservoir and its associated Recreation Areas would have a **less-than-significant impact** on recreation use levels at existing recreational facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Implementation of Alternative A would not affect the operation of any of these other reservoirs within the Secondary Study Area. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

Refer to the **Impact Rec-1** discussion. Because no operational changes would occur at these other reservoirs within the Secondary Study Area, no hazardous conditions for water-based activities would be created. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

The following Project facility locations do not currently provide public recreation opportunities and would continue to provide little or no recreation opportunities if Alternative A is implemented, so there would be **no impact** to recreation resources at these locations from constructing or operating Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative:

- Sites Reservoir Dams
- Road Relocations and South Bridge
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR

- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline Electrical Switchyard
- Project Buffer

The remaining Project facilities and their potential impacts to recreation resources are described below.

Sites Reservoir Inundation Area and Recreation Areas

The recreation-day benefit value for Sites Reservoir was calculated for the purpose of comparison between Alternatives A, B, and C. Based on the expected operation of the reservoir, the recreation-day benefit value for the Alternative A Sites Reservoir would be 30.

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

The only existing recreational facilities within the Primary Study Area are the private duck clubs located along the proposed Delevan Pipeline. The operation of the Alternative A 1.27-MAF Sites Reservoir and associated recreation areas would not increase the use of those duck clubs. There would, therefore, be **no impact** to the existing recreational facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because the operation of Sites Reservoir and its associated recreation areas would not increase use levels at existing private duck clubs within the Primary Study Area, the construction or expansion of the existing duck clubs would not be required. There would, therefore, be **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-3: Reduce Recreation Use Levels at Existing Recreational Facilities by Providing an Alternative New Site for Recreation Visitors

The effects to recreation use levels resulting from the provision of a new Sites Reservoir are evaluated within the Extended and Secondary study area discussions for each facility that is included in those study areas.

Sites Reservoir would not be expected to reduce recreation use levels at the private duck clubs located within the Primary Study Area because Sites Reservoir would not offer hunting opportunities. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-5: Reduce Recreation Use Levels at Existing Recreational Facilities during the Period of Construction

There are no existing developed or public recreational facilities within the footprint of the proposed Sites Reservoir Inundation Area or its associated Recreation Areas. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline and Delevan Transmission Line

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

During construction of the Delevan Pipeline, land that the proposed pipeline and transmission line would cross that is owned by private duck clubs would be fallowed, which would reduce the amount of habitat available to waterfowl and, consequently, could reduce hunting opportunities on those lands. In response, it is possible that hunters who hunt on these lands would instead temporarily use other nearby duck clubs during the Alternative A construction period. However, duck clubs impose limits on recreation use levels, so they would not experience a level of use that would result in substantial deterioration of their facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During operation of the Delevan Pipeline and Transmission Line, these lands would be restored to their original condition and would support the same recreation use levels. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Refer to the **Impact Rec-1** discussion. Because private duck clubs impose limits on recreation use levels, the potential redirected use of these clubs during the construction period for the Delevan Pipeline and Transmission Line would not require the construction or expansion of those facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-5: Reduce Recreation Use Levels at Existing Recreational Facilities during the Period of Construction

There are several private duck clubs located on lands where the Delevan Pipeline and Delevan Transmission Line alignments are proposed to be located. Hunting use at these clubs would be adversely affected during the Alternative A construction period because the fields within the construction disturbance area would be fallowed for at least one season. However, the loss of hunting opportunity would be minimized by the construction schedule for the Alternative A Delevan Pipeline alignment, which, based on other environmental considerations, would minimize the total amount of fields that would be fallowed during each year of construction of Alternative A, rather than fallowing the entire length of the construction disturbance area for the entire Alternative A construction period. In addition, hunting opportunities would still exist on adjacent lands. Therefore, this phased construction approach would have a **less-than-significant impact** on recreation use levels within the Delevan Pipeline and Transmission Line construction disturbance areas, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Rec-1: Increase the Use of Existing Neighborhood and Regional Parks or Other Recreational Facilities such that Substantial Physical Deterioration of the Facility would Occur or be Accelerated

Some fishing currently occurs along the bank of the Sacramento River near the existing Maxwell Irrigation District Pumping Plant, which is adjacent to the proposed Delevan Pipeline Intake Facilities location. The Delevan Pipeline Intake Facilities' fish screen would extend from this portion of the bank, so it would no longer be available for recreational use. However, current use levels along the bank are low because the bank can be accessed only by private roads that connect to the levee road. Any redirected recreation use of other existing recreational facilities resulting from the loss of access to this river bank is expected to be minimal and would not cause the deterioration of those facilities. Therefore, there would be **a less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-2: Require the Construction or Expansion of Existing Recreational Facilities, which may have an Adverse Physical Effect on the Environment

Because any redirected recreation use of the river bank would be minimal, the redirected use would not require the construction or expansion of existing recreational facilities. Therefore, there would be **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-5: Reduce Recreation Use Levels at Existing Recreational Facilities during the Period of Construction

Refer to the **Impact Rec-1** discussion. The loss of this portion of the river bank during Project construction would eliminate recreation use at this location. However, due to the limited amount of recreation use that occurs there and the alternative opportunities for recreation at nearby areas, the impact would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Boat fishing and recreation in the river would not be affected except within and adjacent to the Project construction disturbance area. Due to this impact being temporary, this impact on recreation use levels would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

During Project operations, releases would be made to the Sacramento River through the Delevan Pipeline Intake Facilities. The increased flows in the immediate vicinity of the facilities could create hazardous boating conditions. However, releases would be made through a fish screen, which would dissipate the energy of the water being released to the river to a velocity of one foot per second. These releases would not be expected to create hazardous boating conditions and would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.7 Impacts Associated with Alternative B

21.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same for San Luis Reservoir, other reservoirs within the Extended Study Area, and wildlife refuges as described for Alternative A.

The impacts associated with Alternative B, as they relate to reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4**), would be the same as described for Alternative A for the other reservoirs within the Extended Study Area, but not for San Luis Reservoir. The effects of operational changes at San Luis Reservoir on recreation use levels and recreation benefits resulting from implementation of Alternative B are discussed below.

San Luis Reservoir

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative B, San Luis Reservoir would be drawn down below the Dinosaur Point Boat Ramp four months fewer over the 82-year period of record within the primary recreation season than with Existing Conditions, and three months fewer over the 82-year period of record within the primary recreation season than with the No Project/No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

Alternative B would dewater the Basalt Boat Ramp, which is the lowest boat ramp, four fewer months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and one less month over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Thus, impacts on boating resulting from implementation of Alternative B would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The Basalt Campground water intake would be dewatered four fewer months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, but one more month over the 82-year period of record within the primary recreation season, when compared to the No Project / No Action Alternative. This would be a **beneficial effect** when compared to Existing Conditions, but would be a **potentially significant impact,** when compared to the No Project/No Action Alternative.

The recreation-day benefit value of Alternative B on San Luis Reservoir would be 4 points for reservoir operation, the same as with Existing Conditions and the No Project/No Action Alternative, so there would be **no impact** on the recreation-day benefit value with implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.7.2 Secondary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same as described for Alternative A for Trinity River, Klamath River, Sacramento River and pump installation at the Red Bluff Pumping Plant, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay. In addition, reduced recreation use levels at existing recreational facilities during the period of construction (**Impact Rec-5**) would be the same as described for Alternative A for the pump installation at the Red Bluff Pumping Plant.

For the remaining facilities, the impacts associated with Alternative B, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same as described for Alternative A. However, the effects of Alternative B operational changes on reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4)** would differ from Alternative A at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. These differences are discussed below.

Trinity Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

If Alternative B is implemented, the Trinity Lake boat ramps would be usable 94 more months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 54 more months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Also, the low water ramps (Cedar Stock and Minersville) would be usable a few additional months. Although not specifically defined, access to boat-in camps would also be improved. These changes would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

The recreation-day benefit value for reservoir operation with implementation of Alternative B would be 15 points, when compared to 12 points for Existing Conditions and 13 points for the No Project/No Action Alternative. This would also be a **beneficial effect** when compared to Existing Conditions and the No Project Alternative**.**

Shasta Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative B, Shasta Lake boat ramps would be usable 63 additional months over the 82-year period of record within the primary recreation season when compared to Existing

Conditions, and 93 more months over the 82-year period of record within the primary recreation season than with the No Project/No Action Alternative. The low water ramps (Centimudi and Jones Valley) would be usable for three additional months. Access to boat-in campsites would also be improved. These changes are a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for Shasta Lake with implementation of Alternative B would be 33 points, when compared to 28 points for Existing Conditions and the No Project/No Action Alternative. This is a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

Lake Oroville

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

The Bidwell Canyon low water ramp would always be in the water with implementation of the No Project/No Action Alternative, and would remain in the water with or without implementation of Alternative B. Alternative B would increase access to the remaining four major boat ramps at Lake Oroville by 15 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 22 months over the 82-year period of record within the primary recreation season when compared to the No Project/No Action Alternative. Access to boat-in camps would be improved slightly due to slightly increased surface water elevations. These changes would be considered a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for Lake Oroville operation with implementation of Alternative B would be 17.5 points, when compared to 17.5 points for Existing Conditions and 16.5 points for the No Project/No Action Alternative. This would result in **no impact** for Alternative B, when compared to Existing Conditions, and a **beneficial effect** for Alternative B, when compared to the No Project/No Action Alternative.

Folsom Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Alternative B would increase access to the Folsom Lake boat ramps by nine months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by 38 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Access to the Low Water Ramp would be increased by one month over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and two months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. This is considered a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for operations at Folsom Lake would be 26 points for Alternative B, as compared to 25 points for Existing Conditions and 22.5 points for the No Project/No Action Alternative. This is considered a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities have no current public recreation uses and would continue to provide negligible if any recreation opportunities after the Project is implemented, so there would be **no impact** to recreation resources at these locations:

- Sites Reservoir Dams
- Road Relocations and South Bridge
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline Electrical Switchyard
- Delevan Transmission Line
- Project Buffer

The Alternative B Recreation Areas, which would provide recreation opportunities, and the Delevan Pipeline construction disturbance area, which currently supports private hunting activities along portions of the alignment and would continue to support those activities during Project operation, would have the same design for alternatives A and B. These facilities would, therefore, have the same impacts on increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), and reduced recreation use levels at existing recreational facilities during the period of construction (**Impact Rec-5**) as described for Alternative A.

With implementation of Alternative B, the Delevan Pipeline Discharge Facility would replace the Delevan Pipeline Intake Facilities that were included in Alternative A. Although the Alternative B Delevan Pipeline Discharge Facility would be much smaller than the Alternative A Delevan Pipeline Intake Facilities, the portion of the river bank described for Alternative A would still become unavailable for shore fishing with implementation of Alternative B. Therefore, the impacts on increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), and reduced recreation use levels at existing recreational facilities during the period of construction (**Impact Rec-5**) at that location would be the same as described for Alternative A. However, the design of the release structure differs for each facility. That difference is discussed below as it relates to hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**).

The Alternative B Sites Reservoir would be 1.81 MAF in size, as compared to the 1.27-MAF Alternative A Sites Reservoir. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), and reduced recreation use levels at existing recreational facilities during the period of construction (**Impact Rec-5**) at existing private duck clubs as described for Alternative A. However, changes in reservoir operation would affect the recreation-day benefit value. Those changes are discussed below and provided for the purpose of comparison to Alternative A.

Sites Reservoir Inundation Area

The Alternative B Sites Reservoir Inundation Area would be larger than described for Alternative A. A larger reservoir has the potential to provide improved recreation opportunities, depending on the operation of the reservoir. However, the larger Alternative B Sites Reservoir would have an associated release-only Delevan Pipeline that would change reservoir operation. When compared to Alternative A, water level fluctuations during the primary recreation season would be increased by Alternative B, resulting in adverse effects to recreation resources. Consequently, the recreation-day benefit value for the Alternative B reservoir would be 19, as compared to 30 for the Alternative A reservoir.

Delevan Pipeline Discharge Facility

Impact Rec-6: Create Hazardous Conditions for Water-Based Activities due to Changes in Operating Criteria

During Project operations, releases would be made to the Sacramento River through the Delevan Pipeline Discharge Facility. The increased flows in the immediate vicinity of the facilities could create hazardous boating conditions. However, releases would be made through energy dissipating valves, which would dissipate the energy of the water being released to the river. These releases would not be expected to create hazardous boating conditions and would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.8 Impacts Associated with Alternative C

21.3.8.1 Extended Study Area

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same for San Luis Reservoir, other reservoirs within the Extended Study Area, and wildlife refuges as described for Alternative A.

Impacts associated with Alternative C as they relate to reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4**), would be the same as described for Alternative A for the other reservoirs within the Extended Study Area, but not for San Luis Reservoir. The effects of operational changes at San Luis Reservoir on recreation use levels and recreation benefits resulting from implementation of Alternative B are discussed below.

San Luis Reservoir

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative C, San Luis Reservoir would dewater the Dinosaur Point boat ramp two additional months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions. However, the Basalt boat ramp, which is the lowest ramp and associated with a campground, would be dewatered four fewer months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions. The four-month increase in availability at the lowest boat ramp would outweigh the two-month decrease in availability of the intermediate ramp. This would therefore be a **less-than-significant impact,** when compared to Existing Conditions.

When compared to the No Project/No Action Alternative, operation of San Luis Reservoir with implementation of Alternative C would dewater the Dinosaur Point boat ramp three additional months over the 82-year period of record within the primary recreation season. Although the low water ramp at the Basalt Campground would be dewatered one month less over the 82-year period of record within the primary recreation season than the No Project/No Action Alternative, the loss of three additional months of availability at Dinosaur Point could outweigh this benefit. This would, therefore, be a **potentially significant impact,** when compared to the No Project/No Action Alternative.

The Basalt Campground water intake would be dewatered three fewer months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, but two more months over the 82-year period of record within the primary recreation season, when compared to the No Project / No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions, but would be a **potentially significant impact,** when compared to the No Project/No Action Alternative.

The recreation-day benefit for San Luis Reservoir with implementation of Alternative C would be 3 points, as compared to 4 points for Existing Conditions and the No Project/No Action Alternative. This one point decrease in recreation-day benefit would be a **significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.8.2 Secondary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same as discussed for Alternative A for Trinity River, Klamath River, Sacramento River and pump installation at the Red Bluff Pumping Plant, Clear Creek, Feather River, American River, Sutter Bypass, Yolo Bypass, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay. In addition, reduced recreation use levels at existing recreational facilities during the period of construction (**Impact Rec-5**) would be the same as described for Alternative A for the pump installation at the Red Bluff Pumping Plant.

For the remaining facilities, the impacts associated with Alternative C, as they relate to increased use of existing recreational facilities (**Impact Rec-1**), construction or expansion of existing recreational facilities (**Impact Rec-2**), reduced recreation use levels at existing recreational facilities from providing an alternative new site for recreation visitors (**Impact Rec-3**), and hazardous conditions resulting from changes in operating criteria (**Impact Rec-6**) would be the same as described for Alternative A. The effects of Alternative B operational changes on reduced recreation use levels and recreation benefits at existing reservoirs or rivers (**Impact Rec-4)** would differ from Alternative A at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. These differences are discussed below.

Trinity Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative C, Trinity Lake boat ramps would be usable 101 more months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 61 more months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Alternative C operation of Trinity Lake would make the Cedar Stock and Minersville boat ramps usable for several additional months and access to the boat-in campsites would also be better. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for Trinity Lake operation would be 16 points for Alternative C, as compared to 12 points for Existing Conditions and 13 points for the No Project/No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

Shasta Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

With implementation of Alternative C, Shasta Lake boat ramps would be available 100 additional months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 130 additional months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. The low water ramps (Centimudi and Jones Valley) would be usable for seven additional months, when comparison to Existing Conditions and the No Project/No Action Alternative. Access to boat-in campsites would be improved. These changes are considered a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for Shasta Lake operation with implementation of Alternative C would be 33 points, when compared to 28 points for Existing Conditions and the No Project/No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

Lake Oroville

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

The Bidwell Canyon low water ramp would always be in the water with implementation of the No Project/No Action Alternative, and would remain in the water with or without implementation of Alternative C. Operation of Lake Oroville with implementation of Alternative C would increase access to the remaining four major boat ramps at Lake Oroville by 11 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and 18 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Access to boat-in campsites would be slightly increased, when compared to Existing Conditions and the No Project/No Action Alternative, due to slight changes in surface water elevations. These changes would result in a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value at Lake Oroville with implementation of Alternative C would be 17.5 points, which is the same as for Existing Conditions, resulting in **no impact**. The No Project/No Action Alternative would be 16.5 points; implementation of Alternative C would increase the value by one point, resulting in a **beneficial effect**.

Folsom Lake

Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria

Implementation of Alternative C would increase access to the Folsom Lake boat ramps by 23 months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and by 52 months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. Access to the Low Water Ramp would be increased by four months over the 82-year period of record within the primary recreation season, when compared to Existing Conditions, and five months over the 82-year period of record within the primary recreation season, when compared to the No Project/No Action Alternative. This would be a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

The recreation-day benefit value for operations at Folsom Lake with implementation of Alternative C would be 26.5 points, as compared to 25 points for Existing Conditions and 22.5 points for the No Project/No Action Alternative, resulting in a **beneficial effect,** when compared to Existing Conditions and the No Project/No Action Alternative.

21.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facility sites have no current public recreation uses and would continue to provide negligible if any recreation opportunities after the Project is implemented, so there would be **no impact** to recreation resources at these locations:

- Sites Reservoir Dams
- Road Relocations and South Bridge
- Sites Pumping/Generating Plant

- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline Electrical Switchyard
- Project Buffer

The Alternative B Recreation Areas, which would provide recreation opportunities, and the Delevan Pipeline route, which currently supports private hunting activities along portions of its alignment and would continue to support those activities during Project operation, would have the same design for all three alternatives. These facilities would, therefore, have the same impacts on recreation resources as described for Alternative A.

The Alternative C design of the Delevan Pipeline Intake Facilities and Delevan Transmission Line is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to recreation resources as described for Alternative A.

The Alternative C design for the Sites Reservoir Inundation Area would be the same as described for Alternative B. Despite the larger size, the reservoir would have the same impacts to recreation resources at existing private duck clubs as described for Alternative A. However, changes in reservoir operation would affect the recreation-day benefit value. Those changes are discussed below and provided for the purpose of comparison to Alternatives A and B.

Sites Reservoir Inundation Area

The Alternative C Sites Reservoir would larger than described for Alternative A, but the same size as described for Alternative B. However, the Delevan Pipeline associated with Alternative C would be able to deliver water to the reservoir (rather than being a release-only pipeline, as is the case with Alternative B). When compared to alternatives A and B, water level fluctuations during the primary recreation season associated with Alternative C would result in beneficial effects to recreation resources. Consequently, the recreation-day benefit value for the Alternative C reservoir would be 39.5, as compared to 19 for the Alternative B reservoir and 30 for the Alternative A reservoir.

21.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 21-9 for the impacts that have been identified as significant or potentially significant.

Table 21-9
Summary of Mitigation Measures for
Potential NODOS Project Impacts to Recreation Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Rec-4: Reduce Recreation Use Levels and/or Recreation Benefits at Existing Reservoirs or Rivers due to Changes in Operating Criteria	San Luis Reservoir (Alternative C)	Significant	Mitigation Measure Rec-4a: Extend the Existing Dinosaur Point Boat Ramp at San Luis Reservoir	Less than Significant
	San Luis Reservoir (Alternatives A, B, and C)	Potentially Significant	Mitigation Measure Rec-4b: Extend the Basalt Campground Water Intake at San Luis Reservoir	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Rec-4a: Extend the Existing Dinosaur Point Boat Ramp at San Luis Reservoir

DWR and Reclamation shall coordinate with California State Parks' Division of Boating and Waterways to extend the Dinosaur Point boat ramp to accommodate the decreased water levels associated with Project operation. The boat ramp extension shall be constructed when San Luis Reservoir reaches a water level below 378 feet. The feasibility of this mitigation has not been evaluated.

Mitigation Measure Rec-4b: Extend the Basalt Campground Water Intake at San Luis Reservoir

DWR and Reclamation shall extend the Basalt Campground water intake to accommodate the expected decreased water levels associated with Project operation. The water intake extension shall be constructed when San Luis Reservoir reaches a water level below 345 feet. The feasibility of this mitigation has not been evaluated.

Implementation of **Mitigation Measures Rec-4a and Rec-4b** would reduce the level of significance of Project impacts to recreation resources to **less than significant**.

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Figures

FIGURE 21-1
Existing Lakes and Reservoirs in the Extended Study Area
North-of-the Delta Offstream Storage Project

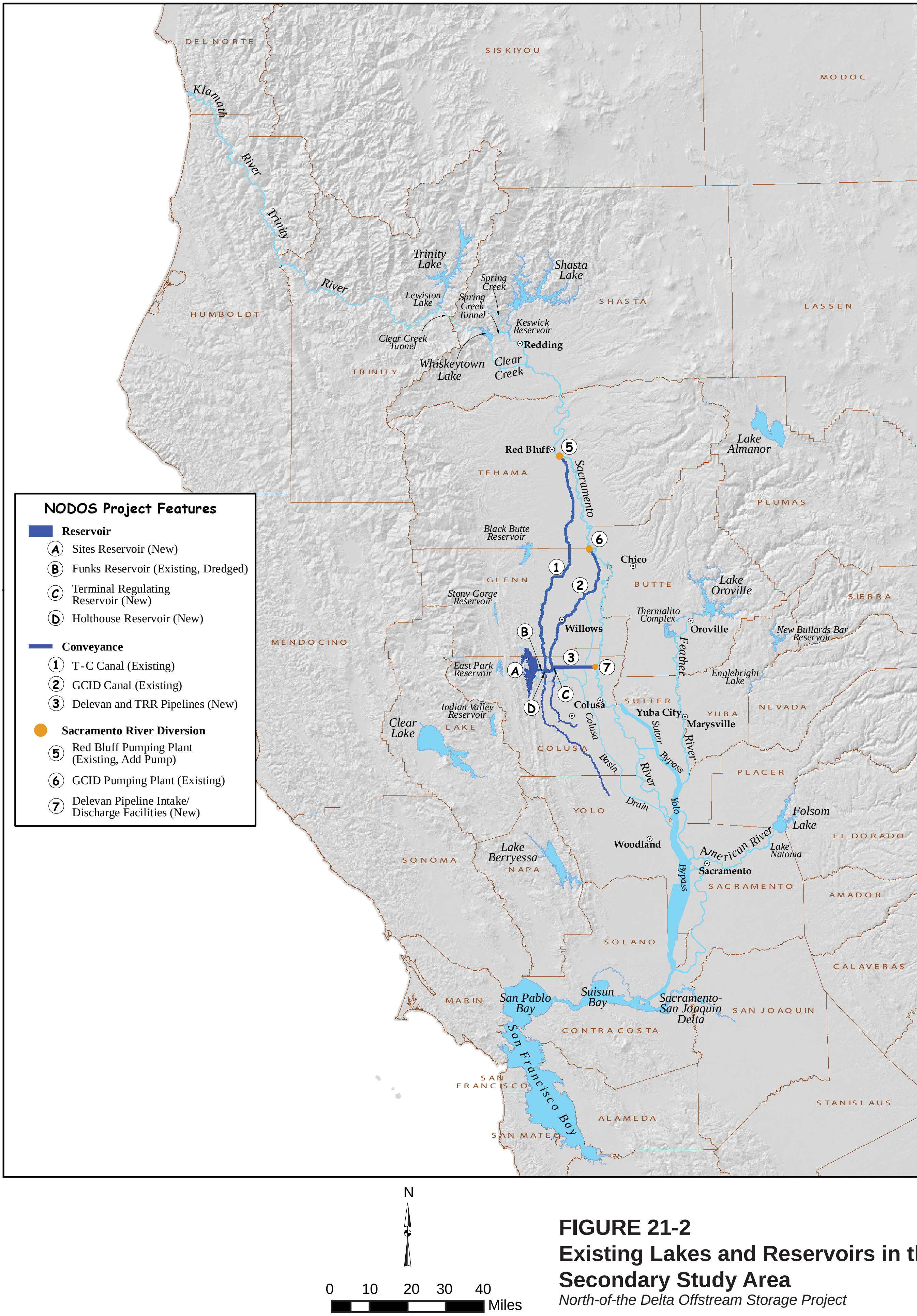

FIGURE 21-2
Existing Lakes and Reservoirs in the Secondary Study Area
North-of-the Delta Offstream Storage Project

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22. Socioeconomics

22.1 Introduction

This chapter describes the socioeconomic setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Measures of social and economic activity described in this chapter include population, housing, industry earnings[1], income[2], annual jobs[3], unemployment, agricultural economics, and local government fiscal resources, as well as characteristics of the industries in the Primary Study Area. The agricultural industry is discussed for the Extended study areas because of the potential for changes in agricultural water deliveries in those areas, as well as agriculture’s widespread and substantial contribution to the State’s economy. The recreation industry is discussed because of the potential changes in water availability in reservoirs and rivers and the potential for changes in these resources.

The regulatory setting for socioeconomic resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

This chapter focuses primarily on the Primary Study Area. However, potential impacts in the Secondary and Extended study areas were evaluated. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, and because none were identified for this resource, no mitigation is included in this chapter.

22.2 Environmental Setting/Affected Environment

22.2.1 Methodology

The collection of Existing Condition socioeconomic information for the Environmental Setting/Affected Environment and impact assessments was based on available data. It is not uncommon for socioeconomic data to be released on a five- or ten-year interval and for the data to change significantly between intervals. Therefore, the most recent socioeconomic data available at the time this chapter was written was used for the Environmental Setting/Affected Environment and impact assessments.

22.2.2 Extended Study Area

The 39 counties in the Extended Study Area were grouped into five water delivery regions: Bay Area, Central Coast, North Coast, Sacramento Valley, San Joaquin, and Southern (Table 22-1). These regions encompass both small rural counties and large metropolitan counties that receive water from the SWP and CVP and that may be affected by Project-related changes in operations and water delivery.

[1] Industry Earnings: Dollar value of production (sales revenues or gross receipts) from each industry.
[2] Income: Employment income (wages and benefits derived at the workplace, including self-employed income).
[3] Annual Jobs: Total of part-time and full-time hourly wage, salary, and self-employed jobs.

Table 22-1
Counties in Water Delivery Regions – Extended Study Area

Water Delivery Region	Counties Included in Water Delivery Region
Bay Area	Alameda, Contra Costa, Napa, Santa Clara
Central Coast	Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz
Sacramento Valley	Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Plumas, Sacramento, Shasta, Solano, Sutter, Tehama, Yolo
San Joaquin	Calaveras, Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, Tuolumne
Southern California	Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura

22.2.2.1 Population

Historical, current, and projected population estimates for the five water delivery regions in the Extended Study Area are summarized in Table 22-2. Historically, the Southern California region has the highest population concentration, with approximately 62 percent of the total Extended Study Area population. Approximately 24 percent of the population in the water delivery regions resides in the Bay Area and San Joaquin regions. The population in the Central Coast region accounts for approximately four percent of the overall regional population, and the Sacramento Valley region accounts for approximately nine percent.

Table 22-2
Historical, Current, and Projected Population and Average Annual Growth Rate within the Extended Study Area and California

Water Delivery Region	Population			Average Annual Growth Rate (%)	
	2000	2010	2030	2000 to 2010	2010 to 2030
Bay Area	4,199,421	4,477,422	5,598,796	0.64	1.12
Central Coast	1,356,626	1,426,240	1,738,133	0.50	0.99
Sacramento Valley	2,850,909	3,286,206	4,528,515	1.43	1.62
San Joaquin	3,397,847	4,072,602	6,683,874	1.83	2.51
Southern California	19,329,839	21,146,847	27,376,256	0.90	1.30
Extended Study Area Total	**31,134,642**	**34,409,317**	**45,925,574**	**1.01**	**1.45**
California	33,871,648	37,253,956	46,688,407	0.96	1.14

Source: DOF, 2012a.

The water delivery regions ranged in population from 1,426,240 residents in the Central Coast region to more than 21 million residents in the Southern California region in 2010. The Southern California region is projected to continue to have a larger share of the Extended Study Area's future population at 59.6 percent (larger than all other regions combined). The proportion of the Bay Area and San Joaquin regional populations is expected to continue to be approximately the same as it has been in the past, at 27 percent (DOF, 2012a).

Table 22-2 also shows the average annual population growth rate in the water delivery regions for the periods from 2000 to 2010 and 2010 to 2030. Between 2000 and 2010, the population in the water delivery regions grew at an average annual rate of 1.01 percent. Among the five regions, the San Joaquin region had the highest growth rate of 1.83 percent, and the Bay Area and the Central Coast regions had the smallest growth rate of 0.64 and 0.50 percent, respectively. The average annual population growth rate is expected to be highest in the San Joaquin region (2.51 percent) and lowest in the Bay Area and Central Coast regions (1.12 and 0.99, respectively) during the 2010 to 2030 period.

22.2.2.2 Economic Activity

Table 22-3 presents measures of economic activity within the Extended Study Area as of 2009. The 39 counties within the Extended Study Area produced approximately $1 trillion in total industry output and had a labor force of 16,623,040. The unemployment rate varied from 10.9 percent in the Bay Area region to 16.5 percent in the San Joaquin region.

Table 22-3
Economic Activity within the Extended Study Area and California in 2009 (2010 Dollars)

Water Delivery Region	Total Personal Income[a] (Thousand $)	Total Industry Output[b] (Thousand $)	Total Civilian Labor Force[c]	Unemployment Rate (%)
Bay Area	236,896,426	183,603,903	2,226,600	10.9
Central Coast	53,354,289	38,148,252	750,000	12.5
Sacramento Valley	126,584,666	86,712,892	1,517,730	14.9
San Joaquin	119,011,208	79,575,465	1,832,610	16.5
Southern California	855,026,941	627,362,787	10,296,100	14.6
Extended Study Area Total	1,390,873,530	1,015,403,299	16,623,040	13.9
California	1,566,999,086	1,145,167,947	18,176,200	12.4

[a]Total personal income is the sum of income received by all persons from all sources.
[b]Total industry output is the total production from all industries in a region for a given year.
[c]Total civilian labor force is the sum of all persons classified as employed.
Source: BEA, 2009.

22.2.2.3 Agricultural Activity

The average irrigated acreage and annual value of production for the five water delivery regions are listed in Table 22-4. The San Joaquin region had the most irrigated crops, in terms of acreage, at 5.6 million acres (approximately 60 percent of the total for the Extended Study Area). The San Joaquin region also had the largest production value of irrigated crops; livestock, dairy, and apiary; and dryland range with $15.6 billion, $8.4 billion, and $77 million, respectively. Of the water delivery regions, the area with the least agricultural production was the Bay Area region, with approximately 105,000 acres of irrigated crops (1.1 percent of the total acreage for the Extended Study Area). Agricultural production value for the Bay Area region was approximately $796 million for irrigated crops; $30 million for livestock, dairy, apiary; and $8.6 million for dryland range.

Table 22-4
Average Irrigated Acreage and Annual Value of Production (2008 to 2010) within the Extended Study Area (2010 Dollars)

Water Delivery Region	Irrigated Crops		Livestock, Dairy, Apiary	Dryland Range
	Acreage	Value (Thousand $)	Value (Thousand $)	Value (Thousand $)
Bay Area	104,914	796,113	30,107	8,620
Central Coast	683,524	6,366,796	161,108	29,586
Sacramento Valley	1,905,226	3,271,313	431,448	28,720
San Joaquin	5,600,756	15,603,416	8,429,888	77,341
Southern California	944,329	5,498,551	1,093,210	4,083
Extended Study Area Total	**9,238,750**	**31,536,188**	**10,145,761**	**148,350**
California	10,651,347	33,737,268	10,914,904	184,619

Sources: USDA, 2009, 2010, and 2011.

22.2.3 Secondary Study Area

The Secondary Study Area is comprised of 22 counties that are grouped into water delivery regions that use CVP water and could be affected by changes in operation and water delivery resulting from the alternatives (Table 22-5).

Table 22-5
Counties in Water Delivery Regions – Secondary Study Area

Water Delivery Region	Counties Included in the Water Delivery Region
Bay Area	Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara
Sacramento Valley	Butte, Colusa, El Dorado, Glenn, Placer, Sacramento, Shasta, Solano, Sonoma, Sutter, Tehama, Yolo, Yuba
North Coast	Del Norte, Humboldt, Trinity

22.2.3.1 Population

Historical, current, and projected population estimates for the three water delivery regions in the Secondary Study Area are summarized in Table 22-6. Historically, the Bay Area region had the highest population concentration, with approximately 63 percent of the total regional population in 2000. Approximately 35 percent of the population in the water delivery regions resides in the Sacramento Valley region. The population in the North Coast region accounts for approximately two percent of the overall regional population.

Table 22-6 also shows the average annual population growth rate in the water delivery regions for the periods from 2000 to 2010 and 2010 to 2030. Between 2000 and 2010, the population in the water delivery regions grew at an average annual rate of 0.82 percent. Among the three regions, the Sacramento Valley region had the highest growth rate of 1.35 percent, and the Bay Area and the North Coast regions had smaller growth rates of 0.52 and 0.58 percent, respectively. The average annual population growth rate is expected to be highest in the Sacramento Valley region (1.61 percent) and lowest in the Bay Area and North Coast regions (0.90 percent) during the 2010 to 2030 period.

Table 22-6
Historical, Current, and Projected Population and Average Annual Growth Rate within the Secondary Study Area and California

Water Delivery Region	Population			Average Annual Growth Rate (%)	
	2000	2010	2030	2000 to 2010	2010 to 2030
Bay Area	5,806,325	6,117,033	7,320,957	0.52	0.90
Sacramento Valley	3,256,885	3,723,468	5,123,713	1.35	1.61
North Coast	167,047	177,019	211,773	0.58	0.90
Secondary Study Area Total	9,230,257	10,017,520	12,656,443	0.82	1.18
California	33,871,648	37,253,956	46,688,407	0.96	1.14

Source: DOF, 2012b.

22.2.3.2 Economic Activity

Table 22-7 presents measures of economic activity within the Secondary Study Area as of 2009. The 22 counties within the Secondary Study Area produced approximately $387 billion in total industry output and had a labor force of 4,939,210. The unemployment rate varied from a low of 10.5 percent in the Bay Area region to a high of 12.8 percent in the Sacramento Valley region. Agricultural economic activity is included in Table 22-7. Additional detail is not provided because impacts to agriculture are only modeled for the Extended Study Area.

Table 22-7
Economic Activity within the Secondary Study Area and California in 2009 (2010 Dollars)

Water Delivery Region	Total Personal Income[a] (Thousand $)	Total Industry Output[b] (Thousand $)	Total Civilian Labor Force[c]	Unemployment Rate (%)
Bay Area	358,592,983	285,948,210	3,114,000	10.5
Sacramento Valley	144,689,070	98,058,833	1,747,540	12.8
North Coast	5,401,584	3,098,813	77,670	12.2
Secondary Study Area Total	508,683,637	387,105,856	4,939,210	11.4
California	1,566,999,086	1,145,167,947	18,176,200	12.4

[a]Total personal income is the sum of income received by all persons from all sources.
[b]Total industry output is the total production from all industries in a region for a given year.
[c]Total civilian labor force is the sum of all persons classified as employed.

Source: BEA, 2009.

22.2.4 Primary Study Area

The section summarizes the existing socioeconomic conditions within the Primary Study Area. Socioeconomic conditions that are described for the Primary Study Area include population, housing, employment, labor force, income, fiscal resources, and agricultural economics. The agriculture sector is discussed in greater detail because of its widespread and substantial contributions to the regional economy.

The Primary Study Area is comprised of Colusa and Glenn counties. These two counties are primarily rural with low populations compared to the rest of the State. There are a few small incorporated cities and several unincorporated areas in these counties. Populations vary in the numerous communities, with populations ranging from a few hundred people (e.g., Elk Creek and Stonyford) to a few thousand people (e.g., Orland and Colusa). Surrounding these communities are farms, ranches, and orchards, most of which have residences associated with them that are not in a delineated community, but are socially tied to a community through general proximity or public services (e.g., school district boundaries and public service delivery areas).

Colusa County encompasses approximately 1,151 square miles. The County seat is the City of Colusa. The County has two incorporated cities (Colusa and Williams) and several unincorporated communities: Maxwell, Arbuckle, Stonyford, Princeton, Grimes, and Sites. As of the 2010 census, approximately 70.5 percent of Colusa County's population was 25 years of age or older and had graduated from high school, and approximately 11.7 percent of that population group had a Bachelor's degree or higher education (U.S. Census Bureau, 2012).

Glenn County is located directly north of Colusa County and encompasses 1,314 square miles. The county seat is the City of Willows. The County has two incorporated cities (Willows and Orland) as well as the unincorporated areas of Hamilton City and Elk Creek. As of the 2010 census, approximately 73.9 percent of Glenn County's population was 25 years of age or older and had graduated from high school, and approximately 16.2 percent of that population group had a Bachelor's degree or higher education (U.S. Census Bureau, 2012).

22.2.4.1 Population

The population density in the Primary Study Area is very low. The highest concentration of people is located in the few incorporated towns, and smaller population concentrations are located in the rural communities throughout the Primary Study Area. In addition, numerous residences associated with agricultural parcels are scattered throughout the two counties.

Table 22-8 lists the population and annual growth rate of both counties within the Primary Study Area for 2000, 2010, projections for 2030, the average annual growth rates from 2000 to 2010, and projected growth rate from 2010 to 2030. Population size has increased by approximately one percent per year throughout the Primary Study Area, increasing by approximately 4,300 people in 10 years from 2000 to 2010.

Table 22-8
Historical, Current, and Projected Population and Average Annual Growth Rate within the Primary Study Area and California

Area	2000	2010	2030	Average Annual Growth Rate 2000-2010 (%)	Average Annual Growth Rate 2010-2030 (%)
Glenn County	26,453	28,122	45,181	0.61	2.40
Colusa County	18,804	21,419	34,488	1.31	2.41
Primary Study Area Total	45,257	49,541	79,669	0.91	2.40
California	33,871,648	37,253,956	46,688,407	0.96	1.14

Source: U.S. Census Bureau, 2012.

Age distribution within the Primary Study Area's counties, compared to the State of California, as of 2010 is shown in Table 22-9. The working age population between ages 20 and 64 is approximately 27,500 people. School age children (ages 5 to 19), adults (ages 20 to 64), and senior citizens (ages 65 and older) represented approximately 24, 56, and 12.6 percent, respectively, of the total population in the Primary Study Area in 2010. This age composition is similar to that of the State.

Table 22-9
Age Distribution within the Primary Study Area Counties and California

	2010 Population (Number and Percent of Total)								
		<5 years of age		5 to 19 years of age		20 to 64 years of age		65+ years of age	
Area	Total	Number	%	Number	%	Number	%	Number	%
Colusa County	21,419	1,841	8.6	5,198	24.2	11,885	55.6	2,495	11.6
Glenn County	28,122	2,178	7.7	6,489	23.1	15,709	55.9	3,737	13.2
Primary Study Area Total	49,541	4,019	8.1	11,687	23.6	27,594	55.7	6,232	12.6
California	37,253,956	2,531,333	6.8	7,920,709	21.3	22,555,400	60.5	4,246,514	11.4

Source: U.S Census Bureau, 2012.

22.2.4.2 Housing

Table 22-10 shows the housing distribution, vacancy rates, and persons per household for the incorporated cities and unincorporated areas included in the counties that comprise the Primary Study Area. As of 2010, there were 27,544 housing units within the Primary Study Area, representing 0.2 percent of the housing units in the State. Of the two counties, Glenn County had the highest number of single-family and multi-family homes in 2010, with 11,548 single-family and 2,836 multi-family homes. Colusa County had 8,855 single-family and 1,688 multi-family homes in 2010. Glenn County had a vacancy rate of 7.73 percent and Colusa County had a vacancy rate of 7.12 percent.

Table 22-10
Housing Distribution within the Primary Study Area and California

County/City	Single-Family	Multiple-Family	Mobile Homes	Total Housing Units	Percent Vacant	Persons Per Household
Glenn County						
Incorporated Area						
Orland	2,045	581	71	2,697	5.15	2.92
Willows	1,657	768	8	2,433	9.82	2.88
Incorporated Area Subtotal	3,702	1,349	79	5,130	7.37	2.90
Unincorporated Area	4,144	138	1,480	5,762	8.59	2.90
Glenn County Total	**7,846**	**1,487**	**1,559**	**10,892**	**8.02**	**2.9**

Table 22-10
Housing Distribution within the Primary Study Area and California

County/City	Single-Family	Multiple-Family	Mobile Homes	Total Housing Units	Percent Vacant	Persons Per Household
Colusa County						
Incorporated Area						
Colusa	1,694	462	52	2,208	5.80	2.80
Williams	1,104	263	67	1,434	4.53	3.73
Incorporated Area Subtotal	2,798	725	119	3,642	5.30	3.18
Unincorporated Area	3,259	238	741	4,238	13.57	2.96
Colusa County Total	**6,057**	**963**	**860**	**7,880**	**9.747749**	**3.06168**
Primary Study Area Total	**13,903**	**2,450**	**2,419**	**18,772**	**8.74**	**2.97**
California	8,747,293	4,247,635	596,938	13,591,866	5.90	2.955

Source: DOF, 2012b.

In 2010, 45 building permits were issued in Glenn County, and 19 building permits were issued in Colusa County (U.S. Census Bureau, 2012).

In 2012, there were nine hotels and two campgrounds/RV parks in Colusa County, and 13 hotels and five campgrounds available in Glenn County (Google Maps, 2012).

22.2.4.3 Economic Activity

Employment and income provide useful insight into an area's economy. A community-level discussion is not provided because employment and income data are available only at the county level.

The Primary Study Area economy is rooted in agriculture. Agriculture became the primary economic driver in the region because of the rich soil, ample water supply, and proximity to urban markets. Today, the agricultural sector is still important in the Primary Study Area, but changes in mechanization and processing have resulted in a much smaller proportion of residents participating in agriculture than during the early part of the 20th century.

Table 22-11 presents measures of economic activity within the Primary Study Area as of 2009. The two counties within the Primary Study Area produced approximately $1.8 billion in total personal income and $1.2 billion in total industry output in 2009. The distribution of the regional personal income was approximately 51 percent and 49 percent for Glenn and Colusa counties, respectively. The distribution of regional earnings by industry was approximately 47 percent and 53 percent for Glenn and Colusa counties, respectively. The Primary Study Area's regional personal income and total industry earnings accounted for approximately one tenth of one percent of California's total personal income and total industry earnings.

Table 22-11
Personal Income and Industry Earnings within the Primary Study Area and California in 2009 (2010 Dollars)

Area	Total Personal Income in 2009 (Thousand $)	Earning by Industry in 2009 (Thousand $)
Glenn County	912,862	586,999
Colusa County	868,203	662,464
Primary Study Area Total	1,781,065	1,249,463
California	1,566,999,086	1,145,167,947

Source: BEA, 2009.

Table 22-12
Employment within the Primary Study Area and California in 2010

Area	Civilian Labor Force	Number of Civilians Employed	Unemployment Rate (%)
Glenn County	12,730	10,660	16.3
Colusa County	11,930	9,500	20.4
Primary Study Area Total	24,660	20,160	18.3
California	18,335,400	16,109,000	12.2

Source: EDD, 2012.

In 2010, the total labor force was 12,730 and 11,930 in Glenn and Colusa counties, respectively. During the same year, there were 18,335,400 people in California's labor force; thus, the labor force in the Primary Study Area comprises approximately 0.13 percent of the State's total labor force. The unemployment rates in 2010 were 16.3 percent for Glenn County and 20.4 percent for Colusa County. In comparison, in 2010, the California unemployment rate was 12.2 percent.

Table 22-13 provides Glenn County's employment by industry, employment share, and annual growth rates. The top three industries in Glenn County in 2010, as measured by the number of employees, were government, agriculture, and services. The retail industry had the highest annual growth rates (at 4.5 percent), followed by the services industry, which had a 1.8 percent annual growth rate. The manufacturing; natural resources, mining, and construction; financial activities, transportation, warehousing, and utilities; and government sectors all experienced negative annual growth rates during that 10-year period.

Table 22-13
Employment by Industry for the Primary Study Area – Glenn County

Industry	2000		2010		2000 to 2010	
	Number of Employees	Employment Share (%)	Number of Employees	Employment Share (%)	Change (%)	Average Annual Growth (%)
Agriculture	1,510	28.7	1,740	32.5	15.2	1.4
Natural Resources, Mining and Construction	320	6.1	260	4.9	-18.8	-2.1
Manufacturing	990	18.8	570	10.6	-42.4	-5.4

Table 22-13
Employment by Industry for the Primary Study Area – Glenn County

Industry	2000		2010		2000 to 2010	
	Number of Employees	Employment Share (%)	Number of Employees	Employment Share (%)	Change (%)	Average Annual Growth (%)
Wholesale	570	10.8	580	10.8	1.8	0.2
Retail	290	5.5	450	8.4	55.2	4.5
Transportation, Warehousing, and Utilities	180	3.4	170	3.2	-5.6	-0.6
Financial Activities	190	3.6	170	3.2	-10.5	-1.1
Services	1,110	21.1	1,330	24.8	19.8	1.8
Government	2,280	30.6	2,210	29.5	-3.1	-0.3
Total Industry Employment	**7,440**	**100.0**	**7,480**	**100**	**0.5**	**0.1**

Source: EDD, 2012.

Table 22-14 provides Colusa County's employment by industry, employment share, and annual growth rates. The top three industries in Colusa County in 2010, as measured by the number of employees, were agriculture, government, and services. The natural resources, mining, and construction industry had the highest annual growth rate (at 19.2 percent), followed by the wholesale industry, which had a 6.5 percent annual growth rate. The transportation, warehousing, and utilities; manufacturing; retail; and agriculture sectors all experienced negative annual growth rates during that 10-year period.

Table 22-14
Employment by Industry for the Primary Study Area – Colusa County

Industry	2000		2010		2000 to 2010	
	Number of Employees	Employment Share (%)	Number of Employees	Employment Share (%)	Change (%)	Average Annual Growth (%)
Agriculture	2,560	33.8	2,470	28.9	-3.5	-0.4
Natural Resources, Mining, and Construction	100	1.3	580	6.8	480.0	19.2
Manufacturing	870	11.5	760	8.9	-12.6	-1.3
Wholesale	320	4.2	600	7.0	87.5	6.5
Retail	520	6.9	480	5.6	-7.7	-0.8
Transportation, Warehousing, and Utilities	220	2.9	180	2.1	-18.2	-2.0
Financial Activities	180	2.4	180	2.1	0.0	0.0
Services	1,040	13.7	1,210	14.2	16.3	1.5
Government	1,770	23.4	2,090	24.4	18.1	1.7
Total Industry Employment	**7,580**	**100.0**	**8,550**	**100**	**12.8**	**1.2**

Source: EDD, 2012.

In total, the Primary Study Area's combined employment in 2000 and 2010 was 15,020 and 16,030, respectively, representing a 6.7 percent increase from 2000 to 2010.

The 2010 median household income in Colusa County was $48,016 and per capita income was $21,317 (Table 22-15). Both the median household income and per capita income were lower than for California. The percentage of persons below the poverty level, 15 percent, was slightly higher than for the State. Approximately 35.3 percent of the population was considered minority (U.S. Census Bureau, 2010).

Table 22-15
Demographics of the Primary Study Area – 2010

Demographic	Glenn County	Colusa County	California
Median household income	$43,074	$48,016	$60,883
Per capita income	$19,987	$21,317	$29,188
Percentage of persons below poverty level	17.5	15.0	13.7
Minority Population	8,132	7,565	15,800,022
Percent minority population	28.9	35.3	42.4

Source: U.S. Census Bureau, 2010.

The 2010_median household income in Glenn County was $43,074 and per capita income was $19,987 (Table 22-15). Both the median household income and per capita income were lower than for California. The percentage of persons below the poverty level was 17.5 percent, which was higher than for the State. Approximately 28.9 percent of the population was considered minority (U.S. Census Bureau, 2010). The population of the Primary Study Area is relatively ethnically diverse as a result of its unique cultural history, the presence of seasonal farm workers, and agricultural past.

22.2.4.4 County Budgets

Glenn and Colusa counties are the local agencies that have taxing authority for the Primary Study Area. Revenues from property taxes are used to fund county governments, local school districts, county roads, local fire departments, libraries, and emergency medical services.

Table 22-16 presents historical and current general fund revenues and expenditures (2008 to 2012) for Glenn County. As shown, the expenditures exceeded revenues in 2010 and 2011, and are expected to exceed revenues in 2012. The majority of the general fund revenues for 2008 to 2012 were from intergovernmental transfers and other financing sources. Taxes ranged from approximately 6.5 percent in 2012 to 13.8 percent in 2009.

Table 22-16
Glenn County General Fund Revenues and Expenditures

	FY 2008 Actual (Thousand $)	FY 2009 Actual (Thousand $)	FY 2010 Actual (Thousand $)	FY 2011 Actual (Thousand $)	FY 2012 Adopted (Thousand $)
Revenues by Source					
Taxes	9,842	10,004	5,614	5,527	5,621
Licenses and Permits	1,109	1,078	1,053	1,004	1,084
Fines, Forfeitures and Penalties	1,456	1,536	1,353	1,368	1,460

Table 22-16
Glenn County General Fund Revenues and Expenditures

	FY 2008 Actual (Thousand $)	FY 2009 Actual (Thousand $)	FY 2010 Actual (Thousand $)	FY 2011 Actual (Thousand $)	FY 2012 Adopted (Thousand $)
Use of Money & Property	616	325	122	144	127
Intergovernmental Transfers	39,319	38,784	42,016	39,095	56,009
Charges for Services	7,571	7,508	8,559	797	6,981
Miscellaneous	2,005	1,148	775	828	876
Other Financing Sources	11,341	12,128	12,091	10,898	13,690
Special Items	N/A	N/A	560	683	446
Total Revenues	**73,259**	**72,511**	**72,143**	**60,344**	**86,293**
Expenditures by Function					
General Government	17,303	16,879	16,297	13,894	16,295
Public Protection	20,770	19,580	18,796	18,014	19,458
Public Ways and Facilities	3,664	4,517	4,594	4,944	16,087
Health and Sanitation	14,124	13,952	14,611	14,344	15,512
Public Assistance	16,097	16,563	16,405	16,333	19,608
Education	563	564	539	536	542
Debt Service	421	407	219	205	220
Contingency	N/A	N/A	N/A	170	200
Reserves	N/A	N/A	2,743	1,747	267
Total Expenditures	**72,941**	**72,461**	**74,204**	**70,189**	**88,190**

Notes
FY = Fiscal Year
NA = Not reported
Source: Glenn County, 2012.

Table 22-17 presents historical and current general fund revenues and expenditures for Colusa County. As shown, revenues exceeded expenditures in 2008, 2009, and 2010; expenditures exceeded revenues in 2011; and are expected to exceed revenues in 2012. The majority of the general fund revenues from 2008 to 2012 were from intergovernmental transfers and other revenues. Taxes ranged from approximately 15.8 percent in 2008 to 28.2 percent in 2012.

Table 22-17
Colusa County General Fund Revenues and Expenditures

	FY 2008 Actual (Thousand $)	FY 2009 Actual (Thousand $)	FY 2010 Actual (Thousand $)	FY 2011 Actual (Thousand $)	FY 2012 Adopted (Thousand $)
Revenues by Source					
Taxes	11,613	12,645	13,807	12,485	17,163
Licenses and Permits	1,109	1,048	1,024	1,133	975
Fines and Forfeitures	1,364	1,146	1,385	1,727	1,525
Use of Money and Property	1,028	790	1,037	447	520
Intergovernmental Revenues	31,046	24,191	25,120	26,029	23,764
Charges for Services	2,571	2,359	2,012	2,030	1,664

Table 22-17
Colusa County General Fund Revenues and Expenditures

	FY 2008 Actual (Thousand $)	FY 2009 Actual (Thousand $)	FY 2010 Actual (Thousand $)	FY 2011 Actual (Thousand $)	FY 2012 Adopted (Thousand $)
Other Revenues	24,544	20,984	16,494	14,298	15,183
Total Revenues	**73,275**	**63,164**	**60,878**	**58,148**	**60,793**
Expenditures by Function					
General Government	9,243	9,059	4,045	9,543	4,799
Public Protection	17,056	17,892	17,261	16,583	17,487
Public Ways and Facilities	16,520	7,845	6,429	12,692	8,742
Health and Sanitation	11,392	11,435	12,410	12,744	12,954
Public Assistance	14,996	15,589	15,343	17,558	17,268
Education	889	920	953	933	1,076
Recreation and Culture	249	361	129	211	142
Total Expenditures	**70,346**	**63,101**	**56,571**	**70,265**	**62,467**

Note:
FY = Fiscal Year
Source: Colusa County, 2012

In total, adopted county general fund revenues and expenditures in 2012 for the Primary Study Area were $147,085,576 and $150,657,602, respectively.

22.2.4.5 Agricultural Economics in the Primary Study Area

Agriculture is a major industry in the Primary Study Area. Major commodities include rice, almonds, dairies, walnuts, and prunes. The total value of production for Glenn County irrigated crops, dryland range, livestock, dairy, and apiary was $520 million per year from 2008 to 2010 (Table 22-18). Rice was the top irrigated crop in terms of acreage harvested, tons produced, and production value. Almonds were the next most valuable crop with a value of production that was slightly less than half the production value of rice.

Table 22-18
Glenn County Average Agricultural Production, 2008 to 2010 (2010 Dollars)

Crop	Harvested Acreage	Production (tons)	Value per acre ($)	Value of Production (Thousand $)
Top Six Irrigated Crops				
Rice	85,154	376,441	2,045	174,133
Almonds	31,097	5,686	2,966	92,236
Walnuts	14,831	28,599	3,113	46,165
Plums, Dried	6,676	14,983	3,363	22,454
Olives	5,781	18,388	2,732	15,794
Alfalfa Hay	16,301	110,934	893	14,549
Other Irrigated Crops				
Other Field, Forage, Miscellaneous	47,315		957	45,295

Table 22-18
Glenn County Average Agricultural Production, 2008 to 2010 (2010 Dollars)

Crop	Harvested Acreage	Production (tons)	Value per acre ($)	Value of Production (Thousand $)
Other Fruit and Nut	2,589		4,697	12,162
Other Vegetables, Nursery	2,664		2,084	5,554
Total Irrigated Crops	212,409		2,017	428,343
Dryland Range	230,000		6.75	1,553
Livestock, Dairy, Apiary				90,110
Total All				**520,006**

Source: USDA 2009, 2010 and 2011

Agriculture is also a leading industry in Colusa County. The total value of production for Colusa County irrigated crops, dryland range, livestock, dairy, and apiary averaged over $637.5 million per year from 2008 to 2010 (Table 22-19). Rice was the top irrigated crop in terms of acreage harvested, tons produced, and production value. Almonds were the next most valuable crop with a value of production that was approximately 43.7 percent of the production of rice.

Table 22-19
Colusa County Average Agricultural Production, 2008 to 2010 (2010 Dollars)

Crop	Harvested Acreage	Production (tons)	Value per acre ($)	Value of Production (Thousand $)
Top Six Irrigated Crops				
Rice	162,160	696,952	1,926	312,392
Almonds	37,403	40,643	3,653	136,638
Walnuts	14,727	679,548	3,487	51,350
Plums, Dried	6,050	10,378	2,626	15,885
Olives	22,600	61,814	568	12,827
Alfalfa Hay	12,267	91,483	986	12,100
Other Irrigated Crops				
Other Field, Forage, Miscellaneous	10,605		3670.29	38,923
Other Fruit and Nut	18,992		1,029	19,544
Other Vegetables, Nursery	4,950		3,634	17,986
Total Irrigated Crops	289,753		2,132	617,645
Dryland Range	183,333		10.12	1,856
Livestock, Dairy, Apiary				18,070
Total All				**637,571**

Source: USDA 2009, 2010 and 2011.

In total, the average irrigated crop acreage from 2008 to 2010 in the Primary Study Area was 502,162, with an average value per acre of $2,083.

22.3 Environmental Impacts/Environmental Consequences

22.3.1 Regulatory Setting

Socioeconomic resources are regulated at the federal, State, and local levels through goals and policies that regulate population growth, housing development, relocation assistance, and industry creation. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

22.3.1.1 Federal Plans, Policies, and Regulations

- Constitution of the United States: Fifth Amendment Takings Clause
- Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970
- Housing and Community Development Act of 1974
- U.S. Department of Agriculture Commodity Programs, Conservation Reserve and Wetland Reserve Programs, Marketing and Credit Assistance, and Crop Insurance and Disaster Assistance

22.3.1.2 State Plans, Policies, and Regulations

- California Constitution: Article 1 Declaration of Rights, Section 19
- California Relocation Assistance Act and the California Relocation Assistance and Real Property Acquisition Guidelines

22.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

22.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for population and housing:

Would the Project:

- Induce substantial population growth in an area either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extensions of roads or other infrastructure)?
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Substantial adverse effects on regional economics.
- Substantial adverse effects on population and housing.

- Substantial adverse effects on local government fiscal conditions.
- Substantial adverse effects on recreation economics.
- Substantial adverse effects on agricultural economics.
- Substantial adverse effects on municipal and industrial (M&I) water use economics.

The determination of impact significance is based on the magnitude of socioeconomic effects that the Project would cause.

- **No impact** indicates no change in socioeconomic conditions would occur.
- A **less-than-significant impact** may or may not be perceptible but is considered a minor (less than five percent) change in socioeconomic conditions.

A **significant impact** with feasible mitigation may be reduced to less-than-significant levels or avoided. Without mitigation measures, a significant impact would cause a major (greater than five percent) change in socioeconomic conditions.

22.3.3 Impact Assessment Assumptions and Methodology

22.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to socioeconomics:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.
- Although the size of the regional economy would likely grow, when comparing Existing Conditions and the No Project/No Action Alternative, Alternative A, Alternative B, and Alternative C, it is assumed that the type of industries and spending patterns by consumers, as examples, would not.

22.3.3.2 Methodology

Part of the socioeconomic analysis is based upon results of hydrologic and water quality analytical model simulations of the Project alternatives, Existing Conditions, and the No Project/No Action Alternative. Operation of Alternatives A, B, and C was analyzed for future conditions that would occur in approximately year 2025. Costs used in the impacts assessment are reported in 2010 dollars (U.S. Department of Commerce, 2012).

The CEQA analysis presents the results of the comparison of socioeconomic conditions associated with construction and operation of Alternatives A, B, and C to those of Existing Conditions. Many of the differences between Alternatives A, B, C, and Existing Conditions are related to the changes that would occur due to assumptions related to the socioeconomic models (such as population growth) and are unrelated to Alternatives A, B, and C. The CEQA analysis also presents the results of a comparison of the No Project/No Action Alternative and Existing Conditions.

The NEPA analysis presents the results of the comparison of socioeconomics conditions associated with operation of Alternatives A, B, and C to those of the No Project/No Action Alternative. In accordance with NEPA, the No Project/No Action Alternative represents the reasonably foreseeable future conditions that may occur if the alternatives are not approved; the future No Project/No Action Alternative conditions include several projects and programs (refer to Chapter 3 Description of Proposed Project//Proposed Action and Alternatives for details). It is important that the No Project/No Action Alternative assumptions are not speculative to avoid causing the results of the impact assessment to misrepresent either the impacts or benefits of the alternatives.

Although Appendix G of the *CEQA Guidelines* indicates that “economic or social effects of a project shall not be treated as significant effects on the environment”, economic and social effects are included in this Draft EIR/EIS for “determining the significance of physical changes caused by the project”. Although significance criteria were applied to the Project-related socioeconomic effects, the physical effects related to the socioeconomic effects were addressed in other chapters of this EIR/EIS. Chapters that address the Project-related physical effects related to the economic and social effects include: Chapter 6 Surface Water Resources, Chapter 7 Surface Water Quality, Chapter 20 Land Use, Chapter 21 Recreation Resources, and Chapter 29 Public Services and Utilities.

This chapter addresses the Project-related socioeconomic effects in relation to:

- Regional economics
- Population and housing
- Local government fiscal conditions
- Recreation economics
- Agricultural economics
- M&I water use economics

The Secondary Study Area is defined as the area of potential operational effects, including SWP and CVP facilities that could experience reservoir water surface elevation fluctuations and stream flow changes downstream from their facilities. These operational effects are included in the analysis of the Extended Study Area. Therefore, no separate impact analyses were undertaken for the economic or social effects of the No Project/No Action Alternative in the Secondary Study Area.

For a summary of the economics analytical framework used for this analysis, see Appendix 22A. Economics model results used in this analysis are included in Appendix 22B.

Regional Economics

Regional economic effects include changes in characteristics such as regional employment and income. The magnitude of the economic effects depends on the initial changes in economic activity within the region (such as construction expenditure or loss of production from existing activities), the interactions within the regional economy, and the "leakage" of economic activity from this regional economy to the larger surrounding economy. Economic linkages create multiplier effects in a regional economy as money is circulated by trade. These linkages are often modeled using large mathematical input-output models such as IMPLAN. IMPLAN, a computer database and modeling system used to create regional economics models for any combination of United States counties, is used in this analysis. For a detailed description of IMPLAN, see Appendix 22C.

An IMPLAN model of the Primary Study Area was used to estimate total changes in employment and income as a result of Project construction and operation, a reduction in temporary and permanent agricultural production, and changes in land use and recreation. Although the size of the economy would change across economic conditions, the structure of the economy would not. The IMPLAN model uses the structural relationship between elements of the economy to identify Project-related socioeconomic impacts. When evaluating temporary impacts, such as Project construction, it is likely that no structural change would occur in the relationship between elements of the economy. Although long-term impacts may incite structural changes, the relatively small Project operation and maintenance impact would not likely do so. Therefore, with no expected change in the structure of the economy across conditions, the Existing Conditions and No Project/No Action Alternative IMPLAN models are the same.

An IMPLAN model was also created for the multi-county Extended Study Area and was used to estimate total changes in employment and income. Changes in employment and income in this study area could result from changes in agricultural production as a result of the operation of the Project. Changes in employment and income in the Secondary Study Area were evaluated as part of the Extended Study Area IMPLAN model. However, Secondary Study Area impacts to employment and income are not reported independent of the Extended Study Area results.

Population and Housing

Estimates of housing demand, both during the construction and operation phases for each alternative, were calculated based on changes in employment that would result from implementation of the Project. The Project is expected to draw from the entire workforce in the Primary Study Area, not merely those workers who are available in the immediate area of construction or operation activity. It is expected that some portion of the construction and operation workforce would be filled by workers in the Primary Study Area who would not demand new housing. However, construction and operation would require specialty occupations that require skills that are not likely available in the local workforce. Thus, out-of-region contractors may import crews to the Project area. These workers may immigrate from outside the Primary Study Area and demand additional housing. Because of the likelihood that specialized occupations and out-of-region contractors would immigrate to the region, it is expected that additional housing demand would occur in the Primary Study Area. The proportion of construction and operation employees that would be locally supplied from within the Primary Study Area was determined through consultations with the engineering staff who developed Project cost estimates.

The estimates of housing demand increases were compared to the Primary Study Area real estate vacancy rates and availability of temporary lodging to assess whether capacity exists in the area to support additional demand for temporary (during construction) and long-term (during operation) housing as a result of the Project.

Total estimated changes in population as a result of the Project were calculated by multiplying the average number of persons per household (DOF, 2012b) by the average number of workers anticipated to be needed for the Project using the results of the Primary Study Area IMPLAN analysis. As with the IMPLAN analysis, the impact assessment is based on the change in conditions, with Existing Conditions and No Project/No Action Alternative considered the same condition. Population changes were assessed for the short-term construction phase and for the longer-term operation phase. The changes in population resulting from construction and operation of an alternative were then compared to the projected population. In instances where population changes are anticipated to deviate from the historical annual average for the Primary Study Area (2000 to 2010), an impact was identified and discussed.

Local Government Fiscal Conditions

Fiscal effects on local governments would occur from changes to property tax revenue resulting from Project-related land acquisition. The fiscal impact analysis evaluated the estimated loss of property tax revenue resulting from potential conversion of existing land uses. An alternative would result in changes to existing land use that, in turn, would affect the property taxes on affected parcels. Tax rolls and redemption rolls were acquired for lands in the footprint of the alternatives and for the Project Buffer. Each county’s tax roll dataset includes an itemization of county and special assessment related taxes. A GIS analysis identified affected parcels and associated property taxes using the tax roll data and parcel boundary information. For the purposes of this analysis, the entire affected parcel is expected to be acquired if it is located in the Project facility footprint. The total annual change in tax revenue associated with the affected parcels was then calculated for each taxing entity for each alternative. As with the IMPLAN analysis, the impact assessment is based on the change in conditions, with Existing Conditions and No Project/No Action Alternative considered the same condition.

Recreational Economics

Recreational economic effects in the Primary Study Area would occur from a change in recreational expenditures. It is expected that recreation visitation and expenditures would increase within the Primary Study Area as a result of increased recreation and visitors drawn from other recreational sites. It is anticipated that recreational numbers and patterns would be similar to those of nearby facilities of similar character, specifically Black Butte Reservoir. Recreation visitation is only a function of reservoir water levels and not adjusted for population growth. Informational surveys completed at Black Butte Reservoir were used to estimate the mix of recreational activities at the proposed Sites Reservoir, type of recreational spending that would occur, and the percentage of expenditures originating outside the Primary Study Area (within approximately 60 miles) (Reclamation, 2012). As with the IMPLAN analysis, the impact assessment is based on the change in conditions, with Existing Conditions and No Project/No Action Alternative considered the same condition. The change in recreation expenditures in the Primary Study Area was used in the Primary Study Area IMPLAN model to identify changes in employment and income.

Agricultural Economics

The analysis of the economic effect of land use changes in the Primary Study Area is based on the changes in acreage resulting from the Project facilities’ construction and operation. Quantitative estimates were also made of the change in the value of agricultural production. Estimates were based on the acreage changes and the per-acre crop revenue summarized in Section 22.2.

The economic analysis of changes in agricultural production in the Extended Study Area used results from changes in SWP and CVP water delivery and changes in water quality. See Appendix 22F for an overview of the analytical approach. Changes in agricultural production in the Secondary Study Area are included in the Extended Study Area results.

Agricultural economic effects from changes in SWP and CVP water delivery were evaluated using the Statewide Agricultural Production (SWAP) model, a regional agricultural production model developed specifically for large-scale analysis of agricultural water supply and cost changes. SWAP is a regional model of irrigated agricultural production and economics that simulates the decisions of agricultural producers (i.e., farmers) in California. The model assumes that farmers maximize profit subject to available resource and economic conditions. Within this framework, the model estimates changes in acreage, crop production, and revenues resulting from changes in CVP and SWP water delivery. For a detailed description of SWAP see Appendix 22F.

Water quality effects were evaluated using a separate analysis of costs associated with managing salts in irrigation water. The economic effects of changes in water quality of irrigation water are complex and may occur in the short term and over the long term. Immediate effects of an improvement in salinity can include reduced quantity of water needed for leaching and subsequent irrigation costs, lower soil salinity, improved crop yields, and greater crop selection. Long-term effects are important in drainage-affected areas of the western and southern San Joaquin. A calculation of the value of changes in leaching requirement was used to illustrate the relative magnitude of short-term economic changes associated with salinity. The long-term value of salinity changes depends upon complex interactions among irrigation management, crop selection, and groundwater conditions. Because of this complexity, this long-term effect was described but not quantified.

Municipal and Industrial Water Use Economics

The economic analysis of changes in M&I water supply and quality in the Extended Study Area used results from changes in SWP and CVP water delivery and changes in salinity levels. See Appendix 22D and 22E for an overview of the analytical approach. Changes in M&I water supply and quality in the Secondary Study Area are included in the Extended Study Area results.

M&I water supply economic effects from changes in SWP and CVP water delivery were evaluated using the Least Cost Planning Simulation Model (LCPSIM) and the Other Municipal Water Economics Model (OMWEM). These models were developed by DWR for use in planning and impact studies related to water supply for SWP and CVP. LCPSIM was used to estimate the direct economic effect of changes in the water supply for M&I purposes in the urban areas of the San Francisco Bay – South and the South Coast hydrologic regions (refer to Chapter 7 Surface Water Quality for a description of California's hydrologic regions). Other affected SWP and CVP delivery regions were modeled using OMWEM. System-related energy costs are included in the assessment of M&I water use economics impacts from changes in SWP and CVP water deliveries and resulting changes in regional water portfolio management. However, the assessment of power- and energy-related impacts is discussed in Chapter 31 Power Production and Energy.

LCPSIM is an annual time-step urban water service system reliability management model. Its objective is to estimate the least-cost water supply management strategy for an area, given the mix of available supplies, and considering the costs of new supply augmentation and use reduction options and the costs of water shortages. OMWEM is a set of individual spreadsheet models that were used to estimate economic benefits of changes in SWP or CVP supplies based on estimated water supply and demand conditions. For a detailed description of LCPSIM and OMWEM see Appendix 22D.

For the M&I water quality assessment, two models corresponding to two regions of M&I water users were used. The Lower Colorado River Basin Water Quality Model (LCRBWQM) covers almost the entire urban coastal region of southern California. LCRBWQM was developed by Reclamation and Metropolitan Water District of Southern California for assessing regional effects of salinity. The Bay Area Water Quality Economics Model (BAWQM) includes the portion of the Bay Area region from Contra Costa County south to Santa Clara County. The model uses estimated relationships between salinity and residential damages to estimate the benefits from changes in salinity. For a detailed description of LCRBWQM and BAWQM see Appendix 22E. Note that water quality impacts are a function of water quality and total volume of SWP and CVP deliveries. This is a result of blending of SWP and CVP deliveries that occurs with other imported and local water supply in a region.

22.3.4 Topics Eliminated from Further Analytical Consideration

This EIR/EIS does not address the Project-related socioeconomic effect of flood control, biological-related resources, and power production and energy. The socioeconomic effects of flood control and biological related resources were not included in this chapter because no direct socioeconomic-related impacts have been estimated. This is, in part, due to the limited Project-related flood control socioeconomic benefits and the indirect methods used to estimate the socioeconomic benefits of biological resources (Reclamation, 2012). Project-related effects of power production and energy are included in other socioeconomic impact discussions, such as M&I water use economics. Specifically, water supply costs in LCPSIM account for the power production required to convey water to the San Francisco Bay – South and the South Coast regions.

22.3.5 Impacts Associated with the No Project/No Action Alternative

22.3.5.1 Extended Study Area – No Project/No Action Alternative

<u>**Construction, Operation, and Maintenance Impacts**</u>

Hydrologic Regions, Water Delivery Regions, and Water Delivery Service Areas

Impact Socio-1: Substantial Adverse Effects on Regional Economics

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential to exceed established standards has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on regional economics, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to change the scale of the economy, increasing overall production in the Extended Study Area, when compared to Existing Conditions, but not its structure. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Socio-2: Substantial Adverse Effects on Population and Housing

It is anticipated that population growth in the Extended Study Area would follow the projections described for Existing Conditions if the No Project/No Action Alternative is implemented. Trends in housing demand and supply correspond to population trends. It is, therefore, expected that the growth in housing would match the growth in population. Therefore, **there would not be a substantial adverse effect** on population and housing, when compared to Existing Conditions.

Impact Socio-3: Substantial Adverse Effects on Local Government Fiscal Conditions

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential to exceed established standards has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on local government fiscal conditions, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to change the scale of the economy, increasing overall production in the Extended Study Area, when compared to Existing Conditions, but not its structure. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Socio-4: Substantial Adverse Effects on Recreation Economics

It is anticipated that, if the No Project/Action Alternative is implemented, recreation expenditure patterns in the Extended Study Area would be similar to those described for Existing Conditions. Growth in population is expected to cause growth in recreation economic activity. However, although the scale of recreation economic activity would increase with population growth, the structure of recreation economic activity would not. Therefore, **there would not be a substantial adverse effect** on recreation economics, when compared to Existing Conditions.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Table 22-20 summarizes irrigated crop acreage and value of agricultural production in the Extended Study Area if the No Project/Action Alternative is implemented, and shows the difference from Existing Conditions. These SWAP model results rely on water deliveries. Results are summarized for long-term and Dry and Critical water year average conditions. Agricultural markets are regional phenomena, so all irrigated crop lands in the Sacramento Valley are included, not just those of SWP and CVP contractors. Changes in crop acreage and value would occur over time in the Extended Study Area regardless of whether the Project is implemented. These changes primarily reflect trends in land use patterns, crop mix, and demands for agricultural products.

In the Extended Study Area, with implementation of the No Project/No Action Alternative, nearly $22 billion in crop value would be generated on approximately 7.5 million irrigated acres. Acreage and value of production would be slightly lower under a Dry and Critical water year average condition than long-term water year average condition as a result of lower water deliveries. This level of production is similar to Existing Conditions, and when comparing the No Project/No Action Alternative to Existing Conditions, the change in total irrigated acres would be negligible. However, the increase in demand and subsequent real price of agricultural output for the No Project/No Action Alternative, when compared to

Existing Conditions, would increase the total value of production, where the value of production is calculated by multiplying price by quantity. Because the Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average, no comparison is made with the No Project/No Action Alternative.

Table 22-20
Comparison of Crop Acres and Value of Agricultural Production for the No Project/No Action Alternative and Existing Conditions

Analysis Metric	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average		
Total Irrigated Acreage (Thousand Acres)	**7,484**	**-22**
Sacramento Valley[a]	1,907	2
San Joaquin[a]	5,577	-24
Total Value of Production (Million $)	**21, 996.5**	**3,121.8**
Sacramento Valley	3,711.3	440.0
San Joaquin	18,285.2	2,681.8
Dry and Critical Water Year Average[b]		
Total Irrigated Acreage (Thousand Acres)	**7,453**	**N/A**
Sacramento Valley	1,899	N/A
San Joaquin	5,554	N/A
Total Value of Production (Million $)	**21,995.1**	**N/A**
Sacramento Valley	3,696.1	N/A
San Joaquin	18,299.0	N/A

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions.

Notes:

N/A = Not Applicable
SWAP included relevant regions of agricultural production in the Extended Study Area

Value of production is based on prices received by farmers, in 2010 dollars.

Agricultural economic conditions that are not based on results of the SWAP model are included in the M&I Water Use Economics analysis presented in **Impact Socio-6**. These agricultural areas outside of the SWAP model include SWP water used for irrigation in the Central Coast and South Coast hydrologic regions, and CVP irrigation water delivery in the San Felipe Unit of San Benito and Santa Clara counties.

Agricultural production costs and investments per acre in the Extended Study Area for the No Project/No Action Alternative would be similar to those described for Existing Conditions. Salinity levels of irrigation water delivered to SWP and CVP export service areas in the Extended Study Area for the No Project/No Action Alternative would be similar to that described for Existing Conditions (refer to Chapter 7 Surface Water Quality (electrical conductivity levels) Section 7.3.6.1 for detailed analysis). No additional salinity related costs would be imposed on agricultural lands.

Table 22-21 summarizes the volume and cost of groundwater pumped in the Extended Study Area for the No Project/No Action Alternative, and shows the difference from Existing Conditions. More than 6.5 million acre-feet of groundwater would be pumped under long-term water year average conditions for irrigation purposes, at an estimated cost of more than $700 million per year. The volume and cost of groundwater pumping would increase slightly in Dry and Critical water year average conditions, as a result of reduced surface water delivery to growers, if the No Project/No Action Alternative is implemented. When comparing the No Project/No Action Alternative to Existing Conditions, the reduction in groundwater pumping is a result of increased surface water deliveries and real price of groundwater pumping. The increase in the real price of groundwater pumping would increase the total cost of pumping, prompting producers to use other supplies. However, the No Project/No Action Alternative groundwater pumping could still lead to overdraft, adversely affecting and groundwater quality. Because the Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average, no comparison is made with the No Project/No Action Alternative.

Table 22-21
Comparison of Volume and Cost of Groundwater Pumping for the No Project/No Action Alternative and Existing Conditions

Analysis Metric	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average		
Annual Groundwater Pumped (TAF)	**6,556.5**	**-411.7**
Sacramento Valley[a]	1,405.1	-123.4
San Joaquina	5,151.4	-288.3
Annual Cost of Pumping (Million $)	**701.6**	**104.6**
Sacramento Valley	117.0	13.1
San Joaquin	584.6	91.5
Dry and Critical Water Year Average[b]		
Annual Groundwater Pumped (TAF)	**7,215.9**	**N/A**
Sacramento Valley	1,431.0	N/A
San Joaquin	5,784.9	N/A
Annual Cost of Pumping (Million $)	**788.0**	**N/A**
Sacramento Valley	118.7	N/A
San Joaquin	669.3	N/A

[a]Water delivery regions.
[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions.

Notes:

N/A = Not Applicable
TAF = thousand acre feet

SWAP includes all relevant regions of agricultural production in the Extended Study Area grouped as Sacramento Valley and San Joaquin

Costs are presented in 2010 dollars.

A change in demand and subsequent real price of agricultural commodities, and the cost of inputs in the agricultural production process, specifically energy prices, are the primary reasons for the increase in the value of agricultural production and cost of groundwater pumping, respectively. However, these changes would be gradual and are offsetting. The relative size of the agricultural economy would not change significantly. Therefore, **there would not be a substantial adverse effect** on agricultural economics, when compared to Existing Conditions.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

The water supply conditions in the Extended Study Area for the No Project/No Action Alternative are discussed in Chapter 6 Surface Water Resources. This discussion focuses on the delivered M&I water supply specific to urban areas with modeled water supply costs. The segmentation of M&I water supply regions within the Extended Study Area is based on past M&I water supply economics models.

The No Project/No Action Alternative water deliveries, other water supply, and total supply costs, including management options (the sum of modeled conservation, recycling, and desalination) are reported for the San Francisco Bay – South hydrologic region for long-term and Dry and Critical water year average conditions, including changes from Existing Conditions, in Table 22-22. These changes would occur in the Bay Area subregion of the Extended Study Area.

When comparing the No Project/No Action Alternative to Existing Conditions, total water supply and costs would increase. The increase in water management options and other supply reflect the adoption of management options and transfers to meet increased demand for the No Project/No Action Alternative. Although shortages costs would decrease, the increase in total cost is expected with increased water supply costs, such as the increase in the real price of energy.

Table 22-22
Comparison of M&I Water Supply Deliveries and Costs for the San Francisco Bay-South Hydrologic Region for the No Project/No Action Alternative and Existing Conditions

Analysis Metric	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average		
Total Supply (TAF/Year)	**1,253**	**72**
Project Delivery	426	40
Management Options[a]	10	10
Other Supply	817	22
Total Costs (Million$/Year)	**207,871**	**37,918**
Shortage	5,478	-5,152
Supply[c]	202,394	43,070
Dry and Critical Water Year Average[b]		
Total Supply (TAF/Year)	**1,166**	**89**
Project Delivery	378.8	25
Management Options[a]	10	10
Other Supply	777	54
Total Costs (Million$/Year)	**206,855**	**27,789**
Shortage	15,759	-13,972
Supply[c]	191,096	41,760

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Energy costs of conveyance are included in the cost estimates.

Costs are presented in 2010 dollars.

The No Project/No Action Alternative water deliveries, other water supply, and total supply costs, including management options (the sum of modeled conservation, recycling, and desalination) are reported for the South Coast hydrologic region for long-term and Dry and Critical water year average conditions, including changes from Existing Conditions, in Table 22-23. These changes would occur in the Southern California subregion of the Extended Study Area.

When comparing the No Project/No Action Alternative to Existing Conditions, total water supply and costs would increase. The increase in water management options reflects the adoption of conservation, recycling, and desalinization to meet increased demand for the No Project/No Action Alternative. Other supply would decrease, such as transfers, with demand being met by management options. Although shortages costs would decrease, the increase in total cost is expected to occur with increased water supply costs, such as the real price of energy.

Table 22-23
Comparison of M&I Water Supply Deliveries and Costs for the South Coast Hydrologic Region for the No Project/No Action Alternative and Existing Conditions

Analysis Metric	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average		
Total Supply (TAF/Year)	**5,019**	**441**
Project Delivery	1,371	49
Management Options[a]	510	510
Other Supply	3,138	-118
Total Costs (Million $/Year)	**1,763,622**	**427,827**
Shortage	109,330	-29,937
Supply[c]	1,654,292	57,763
Dry and Critical Water Year Average[b]		
Total Supply (TAF/Year)	**4,719**	**275**
Project Delivery	1,052	-36
Management Options[a]	510	510
Other Supply	3,157	-199
Total Costs (Million $/Year)	**2,038,745**	**532,548**
Shortage	302,768	-112,212
Supply[c]	1,735,977	644,760

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Energy costs of conveyance are included in the cost estimates.

Costs are presented in 2010 dollars.

The average annual water deliveries and associated shortage and supply costs for long-term and Dry and Critical water year average conditions in urban areas modeled outside of the San Francisco Bay-South and South Coast hydrologic regions in the Extended Study Area for the No Project/No Action Alternative, including the difference from Existing Conditions, are listed in Table 22-24. When comparing the No Project/No Action Alternative to Existing Conditions, the change in water deliveries would vary. An increase in water shortages and supply costs is expected from implementation of the No Project/No Action Alternative, with increased demand and water supply costs, such as the real price of energy.

Table 22-24
Comparison of M&I Water Supply Deliveries and Costs Modeled in OMWEM for the No Project/No Action Alternative and Existing Conditions

Water Delivery Region	Average Annual Project Water Deliveries (TAF)		Average Annual Shortage and Supply[c] Cost (Thousand $)	
	No Project/No Action Alternative	Change from Existing Conditions	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average				
Delta	54,332	1,193	9,742	4,091
Bay Area[a]	52,450	4,854	5,860	5,831
Central Coast	45,372	-216	2,692	2,637
Sacramento Valley	22,817	127	4,553	3,389
San Joaquin	99,699	-2,937	1,621	787
Southern California[b]	251,867	6,354	22,496	11,593
Dry and Critical Water Year Average[d]				
Delta	40,672	-4,095	19,422	9,406
Bay Area[a]	36,340	709	11,739	11,659
Central Coast	23,822	-3,686	7,449	7,296
Sacramento Valley	20,697	-68	11,117	8,185
San Joaquin	72,847	-2,790	2,921	1,278
Southern California[b]	186,488	-21,104	47,788	26,350

[a]The results shown here are for San Benito County only.

[b]The results shown here exclude South Coast Hydrologic Area, which is shown separately.

[c]This estimate does not include all water supply-related costs. It includes annual shortage costs and supply costs that might be affected by alternatives, including transfers, groundwater pumping, or other water management options

[d]Sacramento River 40-30-30 index.

Notes:

M&I = municipal and industrial
OMWEM = Other Municipal Water Economics Model
TAF = thousand acre feet

Costs are presented in 2010 dollars.

Water quality conditions in the Extended Study Area were evaluated and discussed with a focus on the salinity conditions specific to regions with modeled salinity costs. The No Project/No Action Alternative long-term average export-weighted annual total dissolved solids (TDS) for the Metropolitan Water District of Southern California, long-term average export-weighted annual TDS and chloride for the Contra Costa and Santa Clara Water District service areas, costs associated with the respective water quality levels, and the difference from Existing Conditions are reported in Table 22-25.

When comparing the No Project/No Action Alternative to Existing Conditions, long-term average export-weighted annual TDS and chloride would decrease. The increase in average annual costs is expected with increased service area population, increasing the total households and related water quality related damages.

Table 22-25
Comparison of M&I Salinity Costs for the No Project/No Action Alternative and Existing Conditions[a,c]

Water Delivery Service Area	Analysis Metric	No Project/No Action Alternative	Change from Existing Conditions
Long-Term Water Year Average			
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	239.8	-7.4
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	253.9	-14.5
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	60.6	-10.4
Metropolitan Water District of Southern California	Average Annual Cost (Thousand $)	N/A	547.0
Contra Costa and Santa Clara Water Districts		N/A	110.8
Dry and Critical Water Year Average[b]			
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	313.0	-8.9
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	275.5	-23.9
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	83.9	-20.1
Metropolitan Water District of Southern California	Average Annual Cost (Thousand $)	N/A	563.1
Contra Costa and Santa Clara Water Districts		N/A	108.6

[a]Results include some damages related to agricultural production in Metropolitan Water District of Southern California's Service Area.

[b]Sacramento River 40-30-30 index.

[c]The Lower Colorado River Basin Water Quality Model and was used for the Metropolitan Water District of Southern California service area and the South Bay Water Quality model was used for the Contra Costa and Santa Clara Water District service areas.

Notes:

M&I = municipal and industrial
mg/L = milligrams per liter
N/A = not applicable
TDS= total dissolved solids

Costs are presented in 2010 dollars.

The change in cost related to M&I water supply and quality in the Extended Study Area would primarily be a result of additional demand and the real increase in water supply-related costs, such as the increase in energy prices. Additional demand would increase the total damages associated with water quality even in the absence of a change in water quality. However, increasing demand would be accompanied by corresponding development of water supply projects and use reduction measures, such as conservation, recycling, and desalinization. Therefore, it is expected that the growth in water supply demand would be accompanied by water supply development. Therefore, **there would not be a substantial adverse effect** on M&I water use economics, when compared to Existing Conditions.

22.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Because the operational effects of the No Project/No Action Alternative were included in the analysis of the Extended Study Area, no separate impact analyses were undertaken for the economic or social effects of the No Project/No Action Alternative in the Secondary Study Area.

22.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

If the No Project/No Action Alternative is implemented, the Project would not be constructed, and socioeconomic effects in the Primary Study Area are expected to be similar to that described for Existing Conditions. In addition, projects included in the No Project/No Action Alternative are not located within the Primary Study Area, and therefore **would not have a substantial adverse effect** on socioeconomic resources, when compared to Existing Conditions.

22.3.6 Impacts Associated with Alternative A

22.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Hydrologic Regions, Water Delivery Regions, and Water Delivery Service Areas

Impact Socio-1: Substantial Adverse Effects on Regional Economics

Agricultural production in the Extended Study Area is expected to change from operation of Alternative A and the resulting changes to SWP and CVP deliveries, impacting employment and income. The estimated change in agricultural production is discussed as effects on agricultural economics (Impact Socio-5). The regional economic effects on employment and income from a change in agricultural production during Project construction, operation, and maintenance would not differ between Existing Conditions and the No Project/No Action Alternative (Table 22-26).

Table 22-26
Change in Extended Study Area Regional Employment and Income Associated with Implementation of Alternative A when Compared to the No Project/No Action Alternative[a,b,c]

Impact	Annual Labor Income (Thousand $)[d]		Annual Jobs	
	Direct	Total[e]	Direct	Total[e]
Agriculture	848	1,996	44.7	72.1

[a]Average annual effect based on long-term water year average conditions.
[b]Based on changes in agricultural production (irrigated acreage) and agricultural commodity prices.
[c]IMPLAN results are changes relative to Existing Conditions and the No Project/No Action Alternative.
[d]Income is reported 2010 dollars.
[e]Includes direct, indirect, and induced effects (defined in Appendix 22C).
Source: Pavich, 2012a.

The increased reliability associated with Alternative A water deliveries would be expected to increase agricultural production in the Extended Study Area less than one percent. This, in turn, would increase annual employment by approximately 72 individuals and annual labor income by more than $1.9 million.

Construction, operation, and maintenance activities would affect the regional economic condition of the Extended Study Area through construction and operation expenditures; Project footprint impacts, such as removal of agricultural land from production; and Project-related impacts. However, the magnitude of the impacts is relatively minor, when compared to the regional economy of the Extended Study Area. Therefore, additional regional economic effects related to Alternative A construction, operation, and maintenance are discussed for the Primary Study Area only.

The increase in total employment and income in the Extended Study Area would result from an increase in agricultural production. The increase in employment and income would not be considered an adverse effect on the regional economy of the Extended Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-2: Substantial Adverse Effects on Population and Housing

The expected population and housing changes associated with construction, operation, and maintenance of Alternative A would be minor, when compared to the population and housing in the Extended Study Area. Therefore, a **less-than-significant impact** on population and housing is expected in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-3: Substantial Adverse Effects on Local Government Fiscal Conditions

The expected local government fiscal conditions changes associated with the construction, operation, and maintenance of Alternative A would be minor, when compared to the government fiscal conditions in the Extended Study Area. Therefore, a **less-than-significant impact** on local government fiscal conditions is expected in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-4: Substantial Adverse Effects on Recreation Economics

The expected changes to recreation economics associated with Alternative A would be minor, when compared to the recreation economics in the Extended Study Area. Therefore, a **less-than-significant impact** on recreation economics is expected in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Estimated agricultural economic changes would be driven by changes in water delivery and water quality conditions. Table 22-27 summarizes the expected changes in irrigated acreage and value of agricultural production that would result in the SWP and CVP export areas as a result of Alternative A operation. Changes are described relative to Existing Conditions and the No Project/No Action Alternative.

Changes in acreage and value relative to Existing Conditions would result from a combination of Alternative A and underlying changes in land use and crop mix unrelated to Alternative A. Total value of irrigated crop production in the Extended Study Area would increase on average by over $3.125 billion per year, with total irrigated crop acreage declining by approximately 19,000 acres. The increase in demand and subsequent real price of agricultural output for the No Project/No Action Alternative, when compared to Existing Conditions, is the reason for the increase in total value of production, even with the decline in irrigated acres.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative A. Total value of irrigated crop production in the Extended Study Area would increase on average by approximately $3.8 million per year, with total irrigated crop acreage increasing by approximately 2,000 acres. In Dry and Critical water year average conditions, the value of production would be approximately $24 million per year higher than for the No Project/No Action Alternative Dry and Critical water year average conditions.

Changes in production costs and investments are a result of, and consistent with, changes in crop acreage. Changes compared to Existing Conditions would be dominated by long-term trends in crop acreage and cropping patterns that are unrelated to Alternative A. Increases in costs and investments relative to the No Project/No Action Alternative would result from the changes in crop acreage shown in Table 22-27. Water supply and crop acreage would increase relative to No Project/No Action Alternative, so no investments in production facilities or growing stock would be lost as a result of implementation.

Table 22-27
Change in Acres and Value of Agricultural Production Associated with Implementation of Alternative A when Compared to the Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Results of Alternative A	Change from Existing Conditions	Change from No Project/No Action Alternative
Long-Term Water Year Average			
Total Crop Acreage (Thousand Acres)	**7,487**	**-19**	**2**
Sacramento Valley[a]	1,908	3	1
San Joaquin[a]	5,579	-22	1
Total Value of Production (Million $)	**22,000.3**	**3,125.7**	**3.8**
Sacramento Valley	3,713.6	442.3	2.3
San Joaquin	18,286.7	2,683.3	1.5
Dry and Critical Water Year Average[b]			
Total Crop Acreage (Thousand Acres)	**7,469**	**N/A**	**17**
Sacramento Valley	1,904	N/A	6
San Joaquin	5,565	N/A	11
Total Value of Production (Million $)	**22,019.4**	**N/A**	**24.4**
Sacramento Valley	3,703.1	N/A	7.0
San Joaquin	18,316.3	N/A	17.4

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions

Notes:

N/A = not applicable

Value of production is based on prices received by farmers, in 2010 dollars.

Long-term average export-weighted TDS and electrical conductivity (EC) would decrease if Alternative A is implemented, when compared to Existing Conditions and the No Project/No Action Alternative, resulting in improved water quality for agricultural production. The economic value of the salinity change is the avoided cost of groundwater pumping. For the Extended Study Area as a whole, the value of avoided pumping as it relates to improved water quality would be approximately $0.436 million per year, when compared to No Project/No Action Alternative.

Table 22-28 summarizes the volume and cost of groundwater pumped in the Extended Study Area. Results are based on SWAP model analysis. Changes in volume and cost relative to Existing Conditions would result from a combination of Alternative A and underlying changes in land use and crop mix unrelated to Alternative A. Total volume pumped in the Extended Study Area would decline on average by almost 462 thousand acre feet (TAF) per year, and total cost of pumping would increase by approximately $97 million per year. The decreased groundwater pumping would be a result of additional surface water available to agriculture in the No Project/No Action Alternative, when compared to Existing Conditions. The increase in pumping costs would be a result of the increase in real energy costs in the No Project/No Action Alternative, when compared to Existing Conditions.

Table 22-28
Change in Volume and Cost of Groundwater Pumping Associated with Implementation of Alternative A when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Results of Alternative A	Change from Existing Conditions	Change from No Action Alternative
Long-Term Water Year Average			
Annual Groundwater Pumped (TAF)	**6,506.5**	**-461.7**	**-49.9**
Sacramento Valley[a]	1,395.9	-132.5	-9.1
San Joaquin[a]	5,110.6	-329.2	-40.8
Annual Cost of Pumping (Million $)	**694.6**	**97.4**	**-7.1**
Sacramento Valley	116.4	12.4	-0.6
San Joaquin	578.2	85.0	-6.5
Dry and Critical Water Year Average[b]			
Annual Groundwater Pumped (TAF)	**7,156.7**	**N/A**	**-59.3**
Sacramento Valley	1,418.3	N/A	-12.7
San Joaquin	5,738.4	N/A	-7.0
Annual Cost of Pumping (Million $)	**780.6**	**N/A**	**-7.4**
Sacramento Valley	117.8	N/A	-0.9
San Joaquin	662.8	N/A	-6.5

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions

Notes:

TAF = thousand acre feet

Cost of pumping is based on prices received by farmers, in 2010 dollars.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative A. Total volume pumped in the Extended Study Area would decline on average by approximately 50 TAF per year, and total cost of pumping would decline by approximately $7 million per year. The declines in pumping and cost would be larger in the Dry and Critical water year average condition.

When comparing Alternative A to Existing Conditions, changes in agricultural economics impacts would result from a combination of Alterative A and underlying changes in land use, crop mix, and real energy and agricultural commodity prices unrelated to Alternative A. The changes that would occur solely as a result of Alternative A, an increase in the value of production and a decrease in groundwater pumping cost, are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-27 and 22-28). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compared to Existing Conditions.

When comparing Alternative A to the No Project/No Action Alternative, the increase in the value of production, along with the decrease in groundwater pumping cost, are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-27 and 22-28). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compared to the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Changes in water supply reliability and related water supply costs in the Extended Study Area attributable to Alternative A operations are described relative to Existing Conditions and the No Project/No Action Alternative. Discussion in this section focuses on the change in water supply reliability specific to urban areas in the SWP and CVP service areas, and estimates of associated changes in water supply costs.

Changes in water supply reliability and related water supply costs in the San Francisco Bay – South hydrologic region are shown in Table 22-29. Project deliveries would increase in Alternative A in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative A with Existing Conditions, the change in management options would always be zero or positive. When comparing Alternative A with the No Project/No Action Alternative, the increase in Project deliveries would not reduce the use of management options (conservation, recycling, and desalination) but would decrease the use of other supplies. Other supplies include local surface water and groundwater, imported non-Project water, baseline recycling and desalination, and transfers.

When comparing Alternative A with Existing Conditions, supply costs would increase in the San Francisco Bay – South hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from increases in population and real energy prices that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. When comparing Alternative A with the No Project/No Action Alternative, the additional Project deliveries, with little change in management options, would increase supply costs. However, shortage costs would decrease enough to offset the increase in supply costs, reducing total costs.

Table 22-29
Change in M&I Water Supply Deliveries and Costs for the San Francisco Bay-South Hydrologic Region Associated with Implementation of Alternative A when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Results of Alternative A	Change from Existing Conditions	Change from No Project/No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**1,272**	**92**	**19**
Project Delivery	434	48	8
Management Options[a]	22	22	12
Other Supply	816	21	-1
Total Costs (Million $/Year)	**206,205**	**36,252**	**-1,666**
Shortage	3,547	-7,083	-1,931
Supply[c]	202,659	43,335	265
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**1,192**	**115**	**26**
Project Delivery	394	40	16
Management Options[a]	22	22	12
Other Supply	776	52	-2
Total Costs (Million$/Year)	**201,727**	**22,661**	**-5,128**
Shortage	9,921	-19,809	-5,837
Supply[c]	91,806	42,470	710

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives, including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Costs are presented in 2010 dollars.

Changes in water supply reliability and related water supply costs in the South Coast hydrologic region are shown in Table 22-30. Project deliveries would increase in Alternative A in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative A with Existing Conditions, the change in management options would always be zero or positive. When comparing Alternative A with the No Project/No Action Alternative, the increase in Project deliveries would allow for increased deliveries to carryover storage and/or reduce the use of management options (conservation, recycling, and desalination) and other supply (transfers).

When comparing Alternative A with Existing Conditions, supply costs would increase in the South Coast hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. When comparing Alternative A with the No Project/No Action Alternative, the additional Project deliveries would reduce the use of management options and other supplies, reducing supply costs. The accompanying reduction in shortage costs would decrease total costs.

Table 22-30
Change in M&I Water Supply Deliveries and Costs for the South Coast Hydrologic Region Associated with Implementation of Alternative A when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Results of Alternative A	Change from Existing Conditions	Change from No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**5,045**	**467**	**26**
Project Delivery	1,434	111	62
Management Options[a]	507	507	-3
Other Supply	3,105	-151	-33
Total Costs (Million $/Year)	**1,702,870**	**367,075**	**-60,752**
Shortage	68,429	-170,837	-40,901
Supply[c]	1,634,441	537,912	-19,851
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**4,779**	**334**	**59**
Project Delivery	1,189	101	137
Management Options[a]	507	507	-3
Other Supply	3,082	-274	-75
Total Costs (Million$/Year)	**1,914,710**	**408,513**	**-124,035**
Shortage	206,045	-208,935	-96,723
Supply[c]	1,708,665	617,448	-27,312

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives, including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Costs are presented in 2010 dollars

When comparing Alternative A and Existing Conditions in the Extended Service Area outside of the San Francisco Bay – South and South Coast hydrologic regions, Project water deliveries would increase in long-term and Dry and Critical water year average conditions, excluding the Delta. When comparing Alternative A to the No Project/No Action Alternative, Project deliveries would increase in long-term and Dry and Critical water year average conditions (Table 22-31).

When comparing Alternative A and Existing Conditions, shortage and water supply costs would increase in both long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. When comparing Alternative A to the No Project/No Action Alternative, shortage and water supply costs would decrease, Table 22-31. The increase in Project deliveries would reduce shortage and water supply costs.

Table 22-31
Change in M&I Water Supply Deliveries and Costs Modeled in OMWEM Associated with Implementation of Alternative A when Compared to Existing Conditions and the No Project/No Action Alternative

Water Delivery Region	Analysis Metric					
	Average Annual Project Water Delivery (TAF)			Average Annual Shortage and Supply Cost[c] (Thousand $)		
	Results of Alternative A	Change from Existing Conditions	Change from No Project/No Action Alternative	Results of Alternative A	Change from Existing Conditions	Change from No Project/No Action Alternative
Long-Term Water Year Average						
Delta	56	3	1	9,337	3,686	-405
Bay Area[a]	55	7	2	5,626	5,597	-234
Central Coast	47	2	2	1,459	1,403	-1,234
Sacramento Valley	23	0	0	4,410	3,247	-143
San Joaquin	104	1	4	1,592	758	-29
Southern California[b]	264	19	13	14,654	3,751	-7,842
Dry and Critical Water Year Average[d]						
Delta	44	-1	3	18,494	8,478	-929
Bay Area[a]	39	4	3	11,227	11,147	-512
Central Coast	28	0	4	4,035	3,882	-3,413
Sacramento Valley	21	0	0	10,747	7,815	-369
San Joaquin	82	6	9	2,804	1,161	-117
Southern California[b]	215	8	29	26,676	5,237	-21,113

[a]The results shown here are for San Benito County only.

[b]The results shown here exclude South Coast Hydrologic Area, which is shown separately.

[c]This estimate does not include all water supply-related costs. It includes annual shortage costs and supply costs that might be affected by alternatives, including transfers, groundwater pumping, or other water management options

[d]Sacramento River 40-30-30 index.

Notes:

M&I = municipal and industrial
OMWEM = Other Municipal Water Economics Model
TAF = thousand acre feet

Energy costs of conveyance are included in the cost estimates.

Costs are presented in 2010 dollars.

The change in salinity-related costs in the Extended Study Area attributable to Alternative A operations relative to Existing Conditions and the No Project/No Action Alternative is shown in Table 22-32. Discussion in this section focuses on the change in salinity costs specific to regions with modeled salinity costs.

Table 22-32
Change in Water Supply Salinity Costs Associated with Implementation of Alternative A when Compared to Existing Conditions and the No Project/No Action Alternative[a]

Water Delivery Service Area	Analysis Metric	Results of Alternative A	Change from Existing Conditions	Change from No Action Alternative
Long-Term Water Year Average				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	234.3	-12.9	-5.5
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	59.3	-11.7	-1.4
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	252.4	-16.0	-1.5
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$537.1	-$10.0
Contra Costa and Santa Clara Water Districts		N/A	$112.9	-$1.0
Dry and Critical Water Year Average[b]				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	299.3	-22.6	-13.7
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	81.2	-22.7	-2.7
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	273.6	-25.8	-1.9
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$544.9	-$18.1
Contra Costa and Santa Clara Water Districts		N/A	$110.3	-$1.3

[a]Results include some damages related to agricultural production in Metropolitan Water District of Southern California's Service Area.
[b]Sacramento River 40-30-30 index.

Notes:

mg/L = milligrams per liter
N/A = Not applicable
TDS= total dissolved solids

Costs are presented in 2010 dollars. The Lower Colorado River Basin Water Quality Model was used for the Metropolitan Water District of Southern California service area and the South Bay Water Quality model was used for the Contra Costa and Santa Clara Water District service areas.

When comparing Alternative A with Existing Conditions, long-term average export-weighted annual TDS and chloride would decrease in long-term and Dry and Critical water year average conditions across service areas. However, average annual costs would increase. This increase is expected due to population increases that occur in future conditions. When comparing Alternative A with the No Project/No Action Alternative, long-term average export-weighted annual TDS and chloride would decrease in long-term and Dry and Critical water year average conditions in the Metropolitan Water District of Southern California and Contra Costa and Santa Clara Water District service areas. The improvement in water quality would reduce damages in long-term and Dry and Critical water year average conditions.

When comparing Alternative A to Existing Conditions, changes in M&I water use economics impacts would result from a combination of Alterative A and underlying changes in population and the real cost of energy, impacting water system operation costs. The change that would occur solely as a result of Alternative A, decreasing total costs, is not considered an adverse effect on M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on M&I water use economics is expected, when compared to Existing Conditions.

When comparing Alternative A to the No Project/No Action Alternative, the increase in water supply and quality would decrease total costs, which is not considered an adverse effect on the M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on water use economics is expected, when compared to the No Project/No Action Alternative.

22.3.6.2 Secondary Study Area – Alternative A

The operational effects within the Secondary Study Area are included in the analysis of the Extended Study Area and/or Primary Study Area. For example, the minor construction- and operation-related activities at the Red Bluff Pumping Plant are expected to have less-than-significant socioeconomic effects, but are included in the overall construction and operational expenditures used in the regional economic analysis for the Extended and Primary study areas.

22.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Socio-1: Substantial Adverse Effects on Regional Economics

The regional economic effects on employment and income in the Primary Study Area were evaluated for Project construction, operation, and maintenance. Changes are shown relative to Existing Conditions and the No Project/No Action Alternative. There is no difference between the Existing Conditions and No Project//No Action Alternative model used in the analysis. The effects of construction, operation, and maintenance expenditures to employment and income are shown in Table 22-33.

The Project footprint and related facilities, such as roads and utilities, would remove some existing agricultural land from production, so the effects on employment and income would be negative. Some agricultural land removed from production would be temporary, and would be restored to its original use following the construction period.

Alternative A would increase economic activity related to land acquisition in the Primary Study Area. This regional economic impact would be temporary, occurring 12 to 18 months prior to construction. The expected regional economic effects to employment and income in the Primary Study Area from land acquisition are reported in Table 22-33.

Table 22-33
Temporary Change in Regional Employment and Income Associated with Implementation of Alternative A when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[c]	Direct	Total[c]
Agriculture	-636	-1,242	-44.0	-62.2
Land Acquisition	625	717	14.7	17.5
Construction	19,940	44,544	95.9	626.1
Total	**19,929**	**44,019**	**66.6**	**581.4**

[a]Average annual effect based on entire period of construction. The duration of each impact will vary.
[b]IMPLAN results are changes relative to Existing Conditions and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

The expected permanent effects to employment and income from operation and maintenance are shown in Table 22-34. Alternative A would also increase recreational opportunities in the Primary Study Area. The increased recreational expenditures would affect employment and income. The expected regional economic effects to employment and income in the Primary Study Area from the increase in recreational expenditures are reported in Table 22-34.

Table 22-34
Permanent Change in Regional Employment and Income Associated with Implementation of Alternative A when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[c]	Direct	Total[c]
Recreation	487	588	20.1	22.9
Agriculture	-204	-381	-4.7	-9.9
Operation	1,750	2,120	35.0	45.7
Total	**2,033**	**2,327**	**50.4**	**58.7**

[a]Average annual effect based over life of Alternative A.
[b]IMPLAN results are changes relative to Existing Conditions and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported in 2010 dollars.

Source: Pavich, 2012a.

Total employment and income in the Primary Study Area would increase as a result of construction, operation, land acquisition, and a change in agricultural production and recreational opportunities. The increase in employment and income would not be considered an adverse effect on the regional economy of the Primary Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-2: Substantial Adverse Effects on Population and Housing

Population

Construction and operation of Alternative A would require an estimated annual average of 96 and 35 workers, respectively, with a maximum of 60 daily workers for operation. It is anticipated that approximately 50 percent of the construction jobs would be filled from within the existing two-county labor force. However, construction may require specialized skills not readily available in the local labor pool. As a result, it is anticipated that some of the non-local workers would be imported from outside of the two-county region.

When considering the multi-year duration of construction, it is anticipated that 20 percent of the imported workers would relocate to the two-county region, adding to the local population. It is anticipated that all of the workers required for operation would relocate to the two-county region. This additional population from construction and operation would constitute a minor increase in the total 2020 projected Primary study area population of 64,605, and would not pose a burden on local public services, utilities, or infrastructure. Therefore, impacts are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Housing

Changes in housing demand are based on changes in supply resulting from displacement during Project facility construction and changes in housing demand resulting from employment associated with construction and operation of Alternative A.

The construction and operation workforce would most likely commute daily to the Project sites from within the two-county region; however, if needed, there are approximately 2,000 available housing units, as reported in the Environmental Setting/Affected Environment discussion, to accommodate workers who may choose to commute to the Project sites on a workweek basis or who may choose to relocate to the region for the duration of the construction period. In addition to the available housing units, there are recreational vehicle parks within the two-county region to accommodate construction workers. As a result, construction and operation of the Project is not expected to increase the demand for housing within the two-county region.

Within specific local communities, there could be localized effects on housing during construction. However, given the availability of housing within the two-county region, predicting where this impact would occur would be speculative. Construction and operation of Alternative A would result in minor population increases in the Primary Study Area, with adequate housing supply to accommodate the change in population. Therefore, impacts are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-3: Substantial Adverse Effects on Local Government Fiscal Conditions

Table 22-35 lists the change in annual property tax receipts associated with the implementation of Alternative A. For Glenn County, the annual property tax amount that would be removed from the annual tax revenues would be $28,428, or approximately 0.033 percent of the overall revenues for Glenn County. For Colusa County, the annual property tax amount that would be removed from the annual tax revenues from Alternative A would be $252,366, or approximately 0.415 percent of the overall revenues for Colusa County. The counties may also incur costs associated with increased County services that may become necessary as a result of implementing the Project.

A decrease in property tax receipts in the Primary Study Area would result from Alternative A. However, the decrease in property tax revenue would be less than five percent of the overall county revenues. Therefore, impacts of Alternative A to local government fiscal conditions are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 22-35
Change in Property Tax Receipts Associated with Implementation of Alternative A when Compared to the No Project/No Action Alternative

County	Change in Annual Property Tax 2010 ($)	Percentage of County Revenue 2012 Budget (%)
Glenn	28,428	0.033
Colusa	252,366	0.415

Source: Colusa County, 2012.

Impact Socio-4: Substantial Adverse Effects on Recreation Economics

Alternative A would provide recreational opportunities within the Primary Study Area. Table 22-36 shows the estimated number of visitors to Sites Reservoir if Alternative A is implemented. Also included are recreation expenditures attributable to the portion of visitors outside the Primary Study Area. This recreation expenditure information is used to assess the effects on regional economics, i.e., the impact on employment and income. The anticipated total recreation visitation to Sites Reservoir would be more than 360,000 annual visits, increasing recreation expenditures from outside of the Primary Study Area by almost $3 million.

Table 22-36
Estimated Sites Reservoir Recreation Visitation and Expenditures Associated with Implementation of Alternative A*

Activity / Spending Category	Alternative A	
	Visits (Recreation Visitor Days)	Associated Non-Local Spending
Shore fishing	31,405	$214,838
Boat fishing	16,244	$111,123
Picnicking	83,024	$692,092
Sightseeing	71,473	$605,566
Swimming / beach use	81,580	$680,056
Walking	10,468	$74,794
Bicycling	4,693	$33,528
Boating / water-skiing	56,312	$469,419
Other	2,888	$24,073
Total	**358,087**	**$2,905, 489**

*Based on long-term water year average conditions.

Notes:

Costs are presented in 2010 dollars.

Attributed to reservoir-recreation only; the analysis does not account for changes in recreation spending attributed to river-based recreation.

Source: Pavich, 2012b.

Increased levels of recreation at Sites Reservoir would increase recreation expenditures in the Primary Study Area. An increase in recreation expenditures is not considered an adverse effect on the recreation economy of the Primary Study Area. Therefore, a **less-than-significant impact** on recreation economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Construction of Alternative A would convert land from existing agricultural uses to uses that include Project facility footprints, construction staging areas, temporary and permanent roads, utilities, and open space undeveloped lands.

Changes in crop acreage were used to describe the associated changes in economic values. Table 22-37 summarizes the changes in acreage and value of agricultural production that would result in the Primary Study Area as a result of Alternative A construction. Changes are shown relative to Existing Conditions and the No Project/ No Action Alternative by aggregate crop category (agricultural resources do not differ between Existing Conditions and the No Project/No Action Alternative).

Table 22-37
Change in Crop Acres and Value of Agricultural Production Associated with Implementation of Alternative A when Compared to Existing Conditions and No Project/No Action Alternative

Analysis Metric	Alternative A Baseline[b]	Change from Existing Conditions and the No Project/No Action Alternative	
		Temporary[c]	Permanent[c]
Total Crop Acreage (Thousand Acres)[a]	**889.3**	**-4.5**	**-26.2**
Rice	247.2	-3.1	-0.2
Almonds	109.4	-0.1	0.0
Hay and Forage	94.3	-0.2	-0.6
Wheat	22.5	-0.3	-0.1
Tomatoes, Processing	27.9	-0.1	-0.1
Rangeland	388.1	-0.7	-25.3
Total Value of Production (Million $)[a]	**1,050.9**	**-7.1**	**-1.5**
Rice	486.8	-5.8	-0.3
Almonds	359.4	-0.5	-0.1
Hay and Forage	92.0	-0.2	-0.6
Wheat	12.9	-0.2	0.0
Tomatoes, Processing	96.2	-0.4	-0.3
Rangeland	3.7	-0.1	-0.3

[a]Total crop acreage and value of production differ from the sum of individual categories due to rounding.
[b]Permanent impacts of Alternative A.
[c]Temporary impacts are a result of Project construction. Permanent impacts are a result of Project operation.
Note:
Value of production is based on prices received by farmers, in 2010 dollars.
Source: Pavich, 2012c.

Total value of crop production in the Primary Study Area would be expected to decline on average by $7.1 million per year during the Project construction period, and by $1.5 million per year during Project operation. Total crop acreage would decline by approximately 4,500 acres during Project construction (temporary change) and 26,200 acres during Project operation (permanent change). The majority of the decrease in crop acreage during construction would be associated with rice and almost all of the decrease in crop acreage during Project operation would be associated with rangeland.

Alternative A may also affect production costs on lands even if revenues are largely unaffected. Costs could be associated with operational constraints and longer travel times due to Project construction. Construction designs and costs have provided for such effects in two ways. In most cases, affected lands would be within the Project facilities footprint, and are included in the agricultural acreage and value of production described elsewhere in this chapter. For potentially affected lands not included in the facilities footprint, construction costs include temporary and permanent roads and other facilities, as needed to support agricultural production. There could be some additional travel time and other costs associated with using these facilities, but such costs are not environmental impacts requiring mitigation.

Loss of investments in production facilities would occur as a result of Project facilities construction. The value of structures and equipment potentially affected would vary widely across parcels. Much of the equipment is portable (e.g., machinery, tools, portable sprinkler pipe), and could be sold or used on other lands. Shop and storage buildings and permanent irrigation and drainage equipment may have little or no salvage value. The negotiated purchase of lands for the conveyance and associated facilities would compensate for salvage value accordingly. According to Cooperative Extension cost of production studies, permanent structures, irrigation systems, and drainage systems can represent a wide range in investment, from less than $100 per acre for field and vegetable crops up to more than $3,000 per acre for some orchards (UCCE, 2008 and 2011). Most of the facilities would not be new, so their depreciated values would be substantially lower.

Land improvements, including orchards, would also be considered during negotiations for land purchases. Typical investments required to bring permanent crops into production were described in Section 22.2. Forage crops, such as irrigated pasture and alfalfa, require an establishment cost of approximately $400 per acre. The depreciated values of the growing stock could be substantially below these establishment costs, depending on the ages of the stands that would be affected.

Construction and operation of Alternative A would reduce the total value of agricultural production in the Primary Study Area. DWR and Reclamation would provide compensation to property owners for the fair market value of any property acquired through eminent domain for the Project. The decrease in the total value of agricultural production would be less than five percent of the total value of agricultural production in the Primary Study Area. Therefore, a **less-than-significant impact** is expected to the agricultural economy in the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Refer to the **Socio-6** discussion for the Extended Study Area. Given the absence of any affected M&I facilities serving the Primary Study Area residents, no M&I water use economic effects are expected in the Primary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative

22.3.7 Impacts Associated with Alternative B

22.3.7.1 Extended Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

Hydrologic Regions, Water Delivery Regions, and Water Delivery Service Areas

The impacts associated with Alternative B, as they relate to population and housing (**Impact Socio-2**), local government fiscal conditions (**Impact Socio-3**), and recreation economics (**Impact Socio-4**), would be the same as described for Alternative A for the Extended Study Area.

The operational differences of Alternative B within the Extended Study Area, when compared to Alternative A, for the effects on regional economics (**Impact Socio-1**), agricultural economics (**Impact Socio-5**), and M&I water use economics (**Impact Socio-6**) are discussed below.

Impact Socio-1: Substantial Adverse Effects on Regional Economics

Agricultural production in the Extended Study Area would change from operation of Alternative B and the resulting changes to SWP and CVP project deliveries, impacting employment and income. The estimated change in agricultural production is discussed in effects on agricultural economics (Impact Socio-5). The regional economic effects on employment and income from a change in agricultural production during Project construction, operation, and maintenance would not differ between Existing Conditions and the No Project/No Action Alternative (Table 22-38).

The expected increased reliability associated with Alternative B water deliveries would increase agricultural production in the Extended Study Area less than one percent. This, is turn, would increase annual employment by approximately 60 individuals and annual labor income by more than $1.7 million.

Table 22-38
Change in Extended Study Area Regional Employment and Income Associated with Implementation of Alternative B when Compared to the No Project/No Action Alternative[a,b,c]

Impact	Annual Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[d]	Direct	Total[d]
Agriculture	751	1,708	36.6	59.6

[a]Average annual effect based on long-term water year average conditions.
[b]Based on changes in agricultural production (irrigated acreage) and agricultural commodity prices.
[c]IMPLAN results are changes relative to Existing Conditions or the No Project/No Action Alternative.
[d]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

Construction, operation, and maintenance activities would affect the regional economic condition of the Extended Study Area through construction and operation expenditures; Project footprint impacts, such as removal of agricultural land from production; and other Project-related impacts. However, the magnitude of the impacts is relatively minor, when compared to the regional economy of the Extended Study Area. Therefore, additional regional economic effects related to Alternative B construction, operation, and maintenance are discussed for the Primary Study Area only.

The increase in total employment and income in the Extended Study Area would result from an increase in agricultural production. Similar to that described for Alternative A, the increase in employment and income would not be considered an adverse effect on the regional economy of the Extended Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Estimated agricultural economic changes would be driven by changes in water delivery and water quality conditions. Table 22-39 summarizes the expected changes in irrigated acreage and value of agricultural production that would result in the SWP and CVP export areas as a result of operation of Alternative B. Changes are described relative to Existing Conditions and the No Project/No Action Alternative.

Table 22-39
Change in Acres and Value of Agricultural Production Associated with Implementation of Alternative B when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Results of Alternative B	Change from Existing Conditions	Change from No Project/No Action Alternative
Long-Term Water Year Average			
Total Crop Acreage (Thousand Acres)	**7,487**	**-19**	**2**
Sacramento Valley[a]	1,908	3	0
San Joaquin[a]	5,579	-22	1
Total Value of Production (Million $)	**21,999.0**	**3,124.3**	**2.5**
Sacramento Valley	3,711.8	440.5	0.5
San Joaquin	18,287.2	2,683.8	2.0
Dry and Critical Water Year Average[b]			
Total Crop Acreage (Thousand Acres)	**7,462**	**N/A**	**8**
Sacramento Valley	1,903	N/A	4
San Joaquin	5,559	N/A	4
Total Value of Production (Million $)	**22,006.4**	**N/A**	**11.3**
Sacramento Valley	3,699.6	N/A	3.5
San Joaquin	18,306.8	N/A	7.9

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions

Notes:

N/A = not applicable

Value of production is based on prices received by farmers, in 2010 dollars.

Changes in acreage and value relative to Existing Conditions would result from a combination of Alternative B and underlying changes in land use and crop mix unrelated to Alternative B. Total value of irrigated crop production in the Extended Study Area would be expected to decline on average by more than $3.124 billion per year, with total irrigated crop acreage declining by approximately 19,000 acres. The increase in demand and subsequent real price of agricultural output for the No Project/No Action

Alternative, when compared to Existing Conditions, is the reason for the increase in total value of production, even with the decline in irrigated acres.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative B. Total value of irrigated crop production in the Extended Study Area would be expected to increase on average by approximately $2.5 million per year, with total irrigated crop acreage increasing by approximately 2,000 acres. In Dry and Critical water year average conditions, the value of production would be approximately $11.3 million per year higher than for the No Project/No Action Alternative Dry and Critical water year average condition.

Changes in production costs and investments are a result of, and consistent with, changes in crop acreage. Changes compared to Existing Conditions would be dominated by long-term trends in crop acreage and cropping patterns that are unrelated to Alternative B. Increases in costs and investments relative to the No Project/No Action Alternative would result from the changes in crop acreage shown in Table 22-39. Water supply and crop acreage would increase relative to the No Project/No Action Alternative, so no investments in production facilities or growing stock would be lost as a result of implementation.

Long-term average export-weighted TDS and EC would decrease if Alternative B is implemented, when compared to No Project/No Action Alternative and Existing Conditions, resulting in improved water quality for agricultural production. The economic value of the salinity change is the avoided cost of groundwater pumping. For the Extended Study Area as a whole, the value of avoided pumping as it relates to improved water quality would be approximately $0.443 million per year, when compared to No Project/No Action Alternative.

Table 22-40 summarizes the volume and cost of groundwater pumped in the Extended Study Area. Results are based on SWAP model analysis. Changes in volume and cost relative to Existing Conditions would result from a combination of Alternative B and underlying changes in land use and crop mix unrelated to Alternative B. Total volume pumped in the Extended Study Area would decline on average by almost 439 TAF per year, and total cost of pumping would increase by approximately $101 million per year. The decreased groundwater pumping would be a result of additional surface water available to agriculture in the No Project/No Action Alternative, when compared to Existing Conditions. The increase in pumping costs would be a result of the increase in real energy costs in the No Project/No Action Alternative, when compared to Existing Conditions.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative B. Total volume pumped in the Extended Study Area would decline on average by approximately 27 TAF per year, and total cost of pumping would decline by more than $3 million per year. The declines in pumping and cost would be larger in the Dry and Critical water year average condition.

When comparing Alternative B to Existing Conditions, changes in agricultural economics impacts would result from a combination of Alterative B and underlying changes in land use, crop mix, and real energy and agricultural commodity prices unrelated to Alternative B. Similar to that described for Alternative A, the changes that would occur solely as a result of Alternative B, an increase in the value of production and a decrease in groundwater pumping cost, are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-39 and 22-40). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compared to Existing Conditions.

Table 22-40
Change in Volume and Cost of Groundwater Pumping Associated with Implementation of Alternative B when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Annual Groundwater Pumped (TAF)	**6,529.2**	**-438.9**	**-27.3**
Sacramento Valley[a]	1,399.4	-129.1	-5.7
San Joaquin[a]	5,129.9	-309.9	-21.6
Annual Cost of Pumping (Million $)	**698.3**	**101.2**	**-3.3**
Sacramento Valley	116.6	12.7	-0.4
San Joaquin	581.7	12.8	-2.9
Dry and Critical Water Year Average[b]			
Annual Groundwater Pumped (TAF)	**7,177.0**	**N/A**	**-38.9**
Sacramento Valley	1,427.2	N/A	-3.8
San Joaquin	5,749.8	N/A	-35.1
Annual Cost of Pumping (Million $)	**782.4**	**N/A**	**-5.6**
Sacramento Valley	118.4	N/A	-0.3
San Joaquin	664.0	N/A	-5.3

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions.

Notes:

N/A = not applicable
TAF = thousand acre feet

Cost of pumping is based on prices received by farmers, in 2010 dollars.

When comparing Alternative B to the No Project/No Action Alternative, the increase in the value of production, along with the decrease in groundwater pumping cost, are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-39 and 22-40). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compared to the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Changes in water supply reliability and related water supply costs in the Extended Study Area attributable to Alternative B operations are described relative to Existing Conditions and the No Project/No Action Alternative. This discussion focuses on the change in water supply reliability specific to urban areas in the SWP and CVP service areas, and estimates of associated changes in water supply costs.

Changes in water supply reliability and related water supply costs in the San Francisco Bay – South hydrologic region are shown in Table 22-41. Project deliveries would be expected to increase if Alternative B is implemented in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative B with Existing Conditions, the change in management options would always be zero or positive. When comparing Alternative B with the No Project/No Action Alternative, the increase in Project deliveries would allow for increased deliveries to carryover storage and/or not reduce the use of management options (conservation, recycling, and desalination) but would decrease the use of other supplies (transfers).

Table 22-41
Change in M&I Water Supply Deliveries and Costs for the San Francisco Bay-South Hydrologic Region Associated with Implementation of Alternative B when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**1,272**	**91**	**19**
Project Delivery	433	47	7
Management Options[a]	22	22	12
Other Supply	817	22	0
Total Costs (Million $/Year)	**206,324**	**36,370**	**-1,547**
Shortage	3,583	-7,047	-1,895
Supply[c]	202,741	43,418	348
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**1,190**	**113**	**24**
Project Delivery	392	38	13
Management Options[a]	22	22	12
Other Supply	776	53	-1
Total Costs (Million $/Year)	**201,597**	**22,531**	**-5,258**
Shortage	9,416	-20,314	-6,342
Supply[c]	192,181	42,845	1,085

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Costs are presented in 2010 dollars.

When comparing Alternative B with Existing Conditions, supply costs would increase in the San Francisco Bay – South hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from increases in population and real energy prices that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. When comparing Alternative B with the No Project/No Action Alternative, the additional Project deliveries, with little change in management options, would increase supply costs. However, shortage costs would decrease enough to offset the increase in supply costs, reducing total costs.

Changes in water supply reliability and related water supply costs in the South Coast hydrologic region are shown in Table 22-42. Project deliveries would be expected to increase in Alternative B in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No

Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative B with Existing Conditions, the change in management options would always be zero or positive. When comparing Alternative B with the No Project/No Action Alternative, the increase in Project deliveries would reduce the use of management options (conservation, recycling, and desalination) and other supply (local surface and groundwater, imported non-Project, baseline recycling and desalination, and transfers).

Table 22-42
Change in M&I Water Supply Deliveries and Costs for the South Coast Hydrologic Region Associated with Implementation of Alternative B when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**5,043**	**465**	**24**
Project Delivery	1,438	115	66
Management Options[a]	502	502	-8
Other Supply	3,104	-152	-34
Total Costs (Million $/Year)	**1,700,990**	**365,195**	**-62,632**
Shortage	72,857	-166,409	-36,472
Supply[c]	1,628,133	531,604	-26,160
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**4,757**	**313**	**38**
Project Delivery	1,179	91	126
Management Options[a]	502	502	-8
Other Supply	3,077	-279	-80
Total Costs (Million $/Year)	**1,910,843**	**404,646**	**-127,902**
Shortage	225,830	-189,151	-76,938
Supply[c]	1,685,013	593,796	-50,964

[a]Management options include conservation, recycling, and desalinization.
[b]Sacramento River 40-30-30 index.
[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:
M&I = municipal and industrial
TAF = thousand acre feet
Costs are presented in 2010 dollars.

When comparing Alternative B with Existing Conditions, supply costs would be expected to increase in the South Coast hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. Comparing Alternative B with the No Project/No Action Alternative, the additional Project deliveries would reduce the use of management options and other supply, reducing supply costs. The accompanying reduction in shortage costs would decrease total costs.

When comparing Alternative B and Existing Conditions in the Extended Service Area outside of the San Francisco Bay – South and South Coast hydrologic regions, Project water deliveries would increase in long-term and Dry and Critical water year average conditions, excluding the Delta. When comparing Alternative B to the No Project/No Action Alternative, Project deliveries would increase in long-term and Dry and Critical water year average conditions in most regions (Table 22-43).

Table 22-43
Change in M&I Water Supply Deliveries and Costs Modeled in OMWEM Associated with Implementation of Alternative B when Compared to Existing Conditions and the No Project/No Action Alternative

Water Delivery Region	Analysis Metric: Average Annual Project Water Delivery (TAF)			Analysis Metric: Average Annual Shortage and Supply Cost[c] (Thousand $)		
	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average						
Delta	56	3	2	9,287	3,636	-454
Bay Area[a]	54	6	1	5,791	5,763	-69
Central Coast	47	2	2	1,634	1,579	-1,058
Sacramento Valley	23	0	0	4,503	3,340	-49
San Joaquin	104	1	4	1,613	779	-8
Southern California[b]	265	20	13	14,773	3,870	-7,723
Dry and Critical Water Year Average[d]						
Delta	44	-1	3	18,411	8,395	-1,011
Bay Area[a]	38	2	2	11,499	11,419	-240
Central Coast	27	0	4	4,522	4,369	-2,927
Sacramento Valley	21	0	0	10,986	8,054	-131
San Joaquin	81	5	8	2,836	1,194	-85
Southern California[b]	213	5	26	27,861	6,423	-19,927

[a]The results shown here are for San Benito County only.

[b]The results shown here exclude South Coast Hydrologic Area, which is shown separately.

[c]This estimate does not include all water supply-related costs. It includes annual shortage costs and supply costs that might be affected by alternatives, including transfers, groundwater pumping, or other water management options.

[d]Sacramento River 40-30-30 index.

Notes:

M&I = municipal and industrial
OMWEM = Other Municipal Water Economics Model
TAF = thousand acre feet

Costs are presented in 2010 dollars.

When comparing Alternative B and Existing Conditions, shortage and water supply costs would be expected to increase in both long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. When comparing Alternative B to the No Project/No Action Alternative, shortage and water supply costs would decrease (Table 22-43). The increase in Project deliveries would reduce shortage and water supply costs.

The expected change in salinity-related costs in the Extended Study Area attributable to Alternative B operations relative to Existing Conditions and the No Project/No Action Alternative is shown in Table 22-44. Discussion in this section focuses on the change in salinity costs specific to regions with modeled salinity costs.

Table 22-44
Change in Water Supply Salinity Costs Associated with Implementation of Alternative B when Compared to the Existing Conditions and the No Project/No Action Alternative[a]

Water Delivery Service Area	Analysis Metric	Alternative B	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	233.9	-13.3	-5.9
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	59.2	-11.8	-1.5
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	252.2	-16.2	-1.6
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$536.2	-$10.8
Contra Costa and Santa Clara Water Districts		N/A	$112.8	-$1.1
Dry and Critical Water Year Average[b]				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	298.2	-23.7	-14.8
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	80.8	-23.2	-3.1
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	273.0	-26.3	-2.4
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$542.7	-$20.4
Contra Costa and Santa Clara Water Districts		N/A	$110.0	-$1.6

[a]Results include some damages related to agricultural production in Metropolitan Water District of Southern California's Service Area.

[b]Sacramento River 40-30-30 index.

Notes:

mg/L = milligrams per liter
N/A = not applicable
TDS= total dissolved solids

Costs are presented in 2010 dollars. The Lower Colorado River Basin Water Quality Model was used for the Metropolitan Water District of Southern California service area and the South Bay Water Quality model was used for the Contra Costa and Santa Clara Water District service areas.

When comparing Alternative B with Existing Conditions, long-term average export-weighted annual TDS and chloride would be expected to decrease in long-term and Dry and Critical water year average conditions across service areas. However, average annual costs would increase. This increase is expected due to population increases that occur in future conditions. When comparing Alternative B with the No Project/No Action Alternative, long-term average export-weighted annual TDS and chloride would decrease in long-term and Dry and Critical water year average conditions in the Metropolitan Water District of Southern California and Contra Costa and Santa Clara Water District service areas. The improvement in water quality would reduce damages in long-term and Dry and Critical water year average conditions.

When comparing Alternative B to Existing Conditions, expected changes in M&I water use economics impacts would result from a combination of Alterative B and underlying changes in population and the real cost of energy, impacting water system operation costs. Similar to that described for Alternative A, the change that would occur solely as a result of Alternative B, decreasing total costs, is not considered an adverse effect on M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on M&I water use economics is expected, when compared to Existing Conditions.

When comparing Alternative B to the No Project/No Action Alternative, the expected increase in water supply and quality would decrease total costs, which is not considered an adverse effect on the M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on water use economics is expected, when compared to the No Project/No Action Alternative.

22.3.7.2 Secondary Study Area – Alternative B

The operational effects within the Secondary Study Area are included in the analysis of the Extended Study Area and/or Primary Study Area, similar to that described for Alternative A.

22.3.7.3 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Socio-1: Substantial Adverse Effects on Regional Economics

The regional economic effects on employment and income in the Primary Study Area were evaluated during construction, operation, and maintenance. Changes are shown relative to Existing Conditions and the No Project/No Action Alternative. There is no difference between Existing Conditions and the No Project//No Action Alternative model used in the analysis. The expected effects of construction, operation, and maintenance expenditures to employment and income are shown in Table 22-45.

The Project footprint and related facilities, such as roads and utilities, would remove some existing agricultural land from production, so the effects on employment and income would be negative. Some agricultural land removed from production would only be temporary, and restored to its original use following the construction period.

Alternative B would also increase economic activity related to land acquisition in the Primary Study Area. This regional economic impact would be temporary, occurring 12 to 18 months prior to construction. The regional economic effects to employment and income in the Primary Study Area from land acquisition are reported in Table 22-45.

Table 22-45
Temporary Change in Regional Employment and Income Associated with Implementation of Alternative B when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $) Direct	Labor Income (Thousand $) Total[c]	Annual Jobs Direct	Annual Jobs Total[c]
Agriculture	-636	-1,242	-44.0	-62.2
Land Acquisition	615	706	14.4	17.2
Construction	20,518	45,253	98.7	631.7
Total	**20,497**	**44,717**	**69.1**	**586.7**

[a]Average annual effect based on entire period of construction. The duration of each impact would vary.
[b]IMPLAN results are changes relative to Existing Condition and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

The expected permanent effects to employment and income from Alternative B operation and maintenance are shown in Table 22-46. The Project would also increase recreational opportunities in the Primary Study Area. The increased recreational expenditures would affect employment and income. The regional economic effects to employment and income in the Primary Study Area from the increase in recreational expenditures are reported in Table 22-46.

Table 22-46
Permanent Change in Regional Employment and Income Associated with Implementation of Alternative B when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $) Direct	Labor Income (Thousand $) Total[c]	Annual Jobs Direct	Annual Jobs Total[c]
Recreation	483	583	19.9	22.7
Agriculture	-199	-372	-4.6	-9.7
Operation	1,500	1,838	30.0	39.7
Total	**1,784**	**2,049**	**45.3**	**52.7**

[a]Average annual effect based over life of Alternative B.
[b]IMPLAN results are changes relative to Existing Conditions and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

Total employment and income in the Primary Study Area would increase as a result of construction, operation, land acquisition, and a change in agricultural production and recreational opportunities. Similar to that described for Alternative A, the increase in employment and income would not be considered an adverse effect on the regional economy of the Primary Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-2: Substantial Adverse Effects on Population and Housing

Population

Construction and operation of Alternative B would require an estimated annual average of 99 and 30 workers, respectively, with a maximum of 60 daily workers for operation. It is anticipated that approximately 50 percent of the construction jobs would be filled from within the existing two-county labor force. However, construction may require specialized worker skills not readily available in the local labor pool. As a result, it is anticipated that some of the non-local workers would be imported from outside the two-county region.

When considering the multi-year duration of construction, it is anticipated that 20 percent of the imported workers would relocate to the two-county region, adding to the local population. It is anticipated that all of the workers required for operation would relocate to the two-county region. Similar to that described for Alternative A, this additional population from construction and operation would constitute a minor increase in the total 2020 projected regional population of 64,605, and would not pose a burden on local public services, utilities, or infrastructure. Therefore, impacts are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Housing

Alternative B construction, operation, and maintenance impacts to housing conditions within the Primary Study Area would be the same as described for Alternative A.

Impact Socio-3: Substantial Adverse Effects on Local Government Fiscal Conditions

Alternative B construction, operation, and maintenance impacts to local government fiscal conditions within the Primary Study Area would be the same as described for Alternative A.

Impact Socio-4: Substantial Adverse Effects on Recreation Economics

Alternative B would provide recreational opportunities within the Primary Study Area. Table 22-47 shows the estimated number of visitors to Sites Reservoir if Alternative B is implemented. Also included are recreation expenditures attributable to the portion of visitors outside the Primary Study Area. This recreation expenditure information is used to assess the effects on regional economics, i.e., the impact on employment and income. Anticipated total recreation visitation to Sites Reservoir would be more than 360,000 annual visits, increasing recreation expenditures from outside of the Primary Study Area by almost $3 million.

Increased levels of recreation at the Sites Reservoir would increase recreation expenditures in the Primary Study Area. Similar to that described for Alternative A, an increase in recreation expenditures is not considered an adverse effect on the recreation economy of the Primary Study Area. Therefore, a **less-than-significant impact** on recreation economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 22-47
Estimated Sites Reservoir Recreation Visitation and Expenditures Associated with Implementation of Alternative B*

Activity / Spending Category	Alternative B	
	Visits (Recreation Visitor Days)	Associated Non-Local Spending
Shore fishing	31,150	$213,096
Boat fishing	16,112	$110,222
Picnicking	82,351	$686,480
Sightseeing	70,894	$600,656
Swimming / beach use	80,919	$674,542
Walking	10,383	$74,187
Bicycling	4,655	$33,256
Boating / water-skiing	55,856	$465,613
Other	2,864	$23,878
Total	**355,184**	**$2,881,930**

*Based on long-term water year average conditions.

Notes:

Costs are presented in 2010 dollars.

Attributed to reservoir-recreation only; the analysis does not account for changes in recreation spending attributed to river-based recreation.

Source: Pavich, 2012b.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Construction of Alternative B would convert land from existing agricultural uses to uses that include direct Project facility footprints, construction staging areas, temporary and permanent roads, utilities, and open space undeveloped lands.

Changes in crop acreage were used to describe the associated changes in economic values. Table 22-48 summarizes the expected changes in acreage and value of agricultural production that would result in the Primary Study Area as a result of Alternative B construction. Changes are shown relative to Existing Conditions and the No Project/ No Action Alternative by aggregate crop category (agricultural resources do not differ between Existing Conditions and the No Project/No Action Alternative).

Total value of crop production in the Primary Study Area would be expected to decline on average by $7.1 million per year during the Project construction period, and by $1.5 million per year during Project operation. Total crop acreage would decline by approximately 4,500 acres during Project construction (temporary change) and 26,100 acres during Project operation (permanent change). The majority of the decrease in crop acreage during construction would be associated with rice and almost all of the decrease in crop acreage during Project operation would be associated with rangeland.

Alternative B may also affect production costs on lands even if revenues are largely unaffected. Costs could be associated with operational constraints and longer travel times due to construction. Construction designs and costs have provided for such effects in two ways. In most cases, affected lands would be within the Project facilities footprint, and are included in the agricultural acreage and value of production described elsewhere in this chapter. For potentially affected lands not included in the facilities footprint, construction costs include temporary and permanent roads and other facilities as needed to support agricultural lands. There could be some additional travel time and other costs associated with using these facilities, but such costs are not environmental impacts requiring mitigation.

Loss of investments in production facilities would occur as a result of facilities construction. The value of structures and equipment potentially affected would vary widely across parcels. Much of the equipment is portable (e.g., machinery, tools, portable sprinkler pipe), and could be sold or used on other lands. Shop and storage buildings and permanent irrigation and drainage equipment may have little or no salvage value. The negotiated purchase of lands for the conveyance and associated facilities would compensate for salvage value accordingly. According to Cooperative Extension cost of production studies, permanent structures, irrigation systems, and drainage systems can represent a wide range in investment, from less than $100 per acre for field and vegetable crops up to over $3,000 per acre for some orchards (UCCE, 2008 and 2011). Most such facilities would not be new, so their depreciated values would be substantially lower.

Table 22-48
Change in Crop Acres and Value of Agricultural Production Associated with Implementation of Alternative B when Compared to Existing Conditions and No Project/No Action Alternative

Analysis Metric	Alternative B Baseline[b]	Change from Existing Conditions and the No Project/No Action Alternative	
		Temporary[c]	Permanent[c]
Total Crop Acreage (Thousand acres)[a]	**889.4**	**-4.5**	**-26.1**
Rice	247.2	-3.1	-0.2
Almonds	109.4	-0.1	0.0
Hay and Forage	94.3	-0.2	-0.6
Wheat	22.5	-0.3	-0.1
Tomatoes, Processing	27.9	-0.1	-0.1
Rangeland	388.1	-0.7	-25.3
Total Value of Production (Million $)[a]	**1,047.9**	**-7.1**	**-1.5**
Rice	486.2	-5.8	-0.3
Almonds	359.3	-0.5	0.0
Hay and Forage	90.9	-0.2	-0.6
Wheat	12.8	-0.2	0.0
Tomatoes, Processing	95.5	-0.4	-0.3
Rangeland	3.1	-0.1	-0.3

[a]Total crop acreage and value of production differ from the sum of individual categories due to rounding.
[b]Permanent impacts of Alternative A.
[c]Temporary impacts are a result of Project construction. Permanent impacts are a result of Project operation.

Note:
Value of production is based on prices received by farmers, in 2010 dollars.

Source: Pavich, 2012c.

Land improvements, including orchards, would also be considered during negotiations for land purchases. Typical investments required to bring permanent crops into production were described in Section 22.2. Forage crops, such as irrigated pasture and alfalfa, require an establishment cost of approximately $400 per acre. The depreciated values of the growing stock could be substantially below these establishment costs, depending on the ages of the stands that would be affected.

Construction and operation of Alternative B would reduce the total value of agricultural production in the Primary Study Area. DWR and Reclamation would provide compensation to property owners for the fair market value of any property acquired through eminent domain for the Project. Similar to that described for Alternative A, the expected decrease in the total value of agricultural production would be less than five percent of the total value of agricultural production in the Primary Study Area. Therefore, a **less-than-significant impact** is expected to the agricultural economy in the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Refer to the **Impact Socio-6** discussion for the Extended Study Area. That discussion also applies to the Primary Study Area.

22.3.8 Impacts Associated with Alternative C

22.3.8.1 Extended Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

Hydrologic Regions, Water Delivery Regions, and Water Delivery Service Areas

The impacts associated with Alternative C, as they relate to population and housing (**Impact Socio-2**), local government fiscal conditions (**Impact Socio-3**), and recreation economics (**Impact Socio-4**), would be the same as described for Alternative A for the Extended Study Area.

The operational differences for Alternative C within the Extended Study Area, when compared to Alternative A, for the effects on regional economics (**Impact Socio-1**), agricultural economics (**Impact Socio-5**), and M&I water use economics (**Impact Socio-6**) are discussed below.

Impact Socio-1: Substantial Adverse Effects on Regional Economics

Agricultural production in the Extended Study Area would be expected to change from operation of Alternative C and the resulting changes to SWP and CVP project deliveries, impacting employment and income. The estimated change in agricultural production is discussed in effects on agricultural economics (Impact Socio-5). The regional economic effects on employment and income from a change in agricultural production during Project construction, operation, and maintenance would not differ between Existing Conditions and the No Project/No Action Alternative Table 22-49.

The expected increased reliability associated with Alternative C water deliveries would increase agricultural production in the Extended Study Area less than one percent. This, is turn, would increase annual employment by approximately 77 individuals and annual labor income by more than $2.1 million.

Construction, operation, and maintenance activities would affect the regional economic condition of the Extended Study Area through construction and operation expenditures; Project footprint impacts, such as removal of agricultural land from production; and other Project-related impacts. However, the magnitude of the impacts is relatively minor when compared to the regional economy of the Extended Study Area. Therefore, additional regional economic effects related to Alternative C construction, operation, and maintenance are discussed for the Primary Study Area only.

Table 22-49
Change in Extended Study Area Regional Employment and Income Associated with Implementation of Alternative C when Compared to the No Project/No Action Alternative[a,b,c]

Impact	Annual Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[d]	Direct	Total[d]
Agriculture	918	2,176	47.3	77.3

[a]Average annual effect based on long-term water year average conditions.
[b]Based on changes in agricultural production (irrigated acreage) and agricultural commodity prices.
[c]IMPLAN results are changes relative to Existing Condition and the No Project/No Action Alternative.
[d]Includes direct, indirect, and induced effects defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

The expected increase in total employment and income in the Extended Study Area would result from an increase in agricultural production. Similar to that described for Alternative A, the increase in employment and income would not be considered an adverse effect on the regional economy of the Extended Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Estimated agricultural economic changes would be driven by changes in water delivery and water quality conditions. Table 22-50 summarizes the expected changes in irrigated acreage and value of agricultural production that would result in the SWP and CVP export areas as a result of operation of Alternative C. Changes are described relative to Existing Conditions and the No Project/No Action Alternative.

Expected changes in acreage and value relative to Existing Conditions would result from a combination of Alternative C and underlying changes in land use and crop mix unrelated to Alternative C. Total value of irrigated crop production in the Extended Study Area would decline on average by over $3.125 billion per year, with total irrigated crop acreage declining by approximately 18,000 acres. The increase in demand and subsequent real price of agricultural output for the No Project/No Action Alternative, when compared to Existing Conditions, is the reason for the increase in total value of production, even with the decline in irrigated acres.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative C. Total value of irrigated crop production in the Extended Study Area would be expected to increase on average by approximately $4.1 million per year, with total irrigated crop acreage increasing by approximately 2,000 acres. In Dry and Critical water year average conditions, the value of production would be approximately $21 million per year higher than in the No Project/No Action Alternative Dry and Critical water year average condition.

Changes in production costs and investments are a result of, and consistent with, changes in crop acreage. Expected changes compared to Existing Conditions are dominated by long-term trends in crop acreage and cropping patterns that are unrelated to Alternative C. Increases in costs and investments relative to the No Project/No Action Alternative would result from the changes in crop acreage shown in Table 22-50. Water supply and crop acreage would increase relative to the No Project/No Action Alternative, so no investments in production facilities or growing stock would be lost as a result of implementation.

Table 22-50
Change in Acres and Value of Agricultural Production Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Total Crop Acreage (Thousand Acres)	**7,488**	**-18**	**2**
Sacramento Valley[a]	1,909	3	1
San Joaquin[a]	5,579	-22	2
Total Value of Production (Million $)	**22,000.7**	**3,125.9**	**4.1**
Sacramento Valley	3,713.6	442.3	2.3
San Joaquin	18,287.0	2,683.6	1.8
Dry and Critical Water Year Average[b]			
Total Crop Acreage (Thousand Acres)	**7,468**	**N/A**	**15**
Sacramento Valley	1,905	N/A	5
San Joaquin	5,564	N/A	9
Total Value of Production (Million $)	**22,016.5**	**N/A**	**21.4**
Sacramento Valley	3,702.6	N/A	6.5
San Joaquin	18,313.9	N/A	14.9

[a]Water delivery region.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions.

Notes:

N/A = not applicable

Value of production is based on prices received by farmers, in 2010 dollars.

Long-term average export-weighted TDS and EC would be expected to decrease if Alternative C is implemented, when compared to No Project/No Action Alternative and Existing Conditions, resulting in improved water quality for agricultural production. The economic value of the salinity change is the avoided cost of groundwater pumping. For the Extended Study Area as a whole, the value of avoided pumping as it relates to improved water quality would be approximately $0.616 million per year, when compared to the No Project/No Action Alternative.

Table 22-51 summarizes the volume and cost of groundwater pumped in the Extended Study Area. Results are based on SWAP model analysis. Changes in volume and cost relative to Existing Conditions would result from a combination of Alternative C and underlying changes in land use and crop mix unrelated to Alternative C. Total volume pumped in the Extended Study Area would decline on average by almost 455 TAF per year, and total cost of pumping would increase by approximately $99 million per year. The decreased groundwater pumping would be a result of additional surface water available to agriculture in the No Project/No Action Alternative, when compared to Existing Conditions. The increase in pumping costs would be a result of the increase in real energy costs in the No Project/No Action Alternative, when compared to Existing Conditions.

Table 22-51
Change in Volume and Cost of Groundwater Pumping Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Annual Groundwater Pumped (TAF)	**6,513.5**	**-454.7**	**-43.0**
Sacramento Valley[a]	1,396.5	-131.9	-8.5
San Joaquin[a]	5,116.9	-322.8	-34.5
Annual Cost of Pumping (Million $)	**695.8**	**98.7**	**-5.8**
Sacramento Valley	116.4	12.5	-0.6
San Joaquin	579.4	86.3	-5.2
Dry and Critical Water Year Average[b]			
Annual Groundwater Pumped (TAF)	**7,155.2**	**N/A**	**-60.8**
Sacramento Valley	1,418.6	N/A	-12.4
San Joaquin	5,736.5	N/A	-48.4
Annual Cost of Pumping (Million $)	**780.1**	**N/A**	**-7.9**
Sacramento Valley	117.9	N/A	-0.8
San Joaquin	662.3	N/A	-7.0

[a]Water delivery regions.

[b]The Existing Conditions SWAP model run is based on long-term water year average conditions and does not report Dry and Critical water year average conditions.

Notes:

N/A = not applicable
TAF = thousand acre feet

Cost of pumping is based on prices received by farmers, in 2010 dollars.

Changes relative to the No Project/No Action Alternative provide an estimate of the changes solely from Alternative C. Total volume pumped in the Extended Study Area would be expected to decline on average by approximately 43 TAF per year, and total cost of pumping would decline by approximately $6 million per year. The declines in pumping and cost would be larger in the Dry and Critical water year average condition.

When comparing Alternative C to Existing Conditions, expected changes in agricultural economics impacts would result from a combination of Alterative C and underlying changes in land use, crop mix, and real energy and agricultural commodity prices unrelated to Alternative C. Similar to that described for Alternative A, the changes that would occur solely as a result of Alternative C, i.e., an increase in the value of production and a decrease in groundwater pumping cost, are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-50 and 22-51). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compared to Existing Conditions.

When comparing Alternative C to the No Project/No Action Alternative, the expected increase in the value of production along with the decrease in groundwater pumping cost are not considered an adverse effect on the agricultural economy in the Extended Study Area (Tables 22-50 and 22-51). Therefore, a **less-than-significant impact** on agricultural economics is expected, when compare to the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Changes in water supply reliability and related water supply costs in the Extended Study Area attributable to Alternative C operations are described relative to Existing Conditions and No Project/No Action

Alternative. Discussion in this section focuses on the change in water supply reliability specific to urban areas in the SWP and CVP service areas, and estimates of associated changes in water supply costs.

Expected changes in water supply reliability and related water supply costs in the San Francisco Bay – South hydrologic region are shown in Table 22-52. Project deliveries would increase in Alternative C in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative C with Existing condition, the change in management options would always be zero or positive. When comparing Alternative C with the No Project/No Action Alternative, the increase in Project deliveries would allow for increased deliveries to carryover storage and/or not reduce the use of management options (conservation, recycling, and desalination) but would decrease use of other supplies (transfers).

Table 22-52
Change in M&I Water Supply Deliveries and Costs for the San Francisco Bay-South Hydrologic Region Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**1,274**	**93**	**21**
Project Delivery	435	49	9
Management Options[a]	22	22	12
Other Supply	817	22	0
Total Costs (Million $/Year)	**206,067**	**36,113**	**-1,804**
Shortage	3,341	-7,289	-2,137
Supply[c]	202,726	43,402	333
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**1,195**	**117**	**28**
Project Delivery	397	43	18
Management Options[a]	22	22	12
Other Supply	776	52	-2
Total Costs (Million $/Year)	**201,273**	**22,206**	**-5,582**
Shortage	9,282	-20,449	-6,477
Supply[c]	191,991	42,655	895

[a]Management options include conservation, recycling, and desalinization.

[b]Sacramento River 40-30-30 index.

[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:

M&I = municipal and industrial
TAF = thousand acre feet

Costs are presented in 2010 dollars.

When comparing Alternative C with Existing Conditions, supply costs would increase in the San Francisco Bay – South hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from increases in population and real energy prices that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. When comparing Alternative C with the No Project/No Action Alternative, the additional Project deliveries, with little change in management options, would increase supply costs. However, shortage costs would decrease enough to offset the increase in supply costs, reducing total costs.

Expected changes in water supply reliability and related water supply costs in the South Coast hydrologic region are shown in Table 22-53. Project deliveries would increase in Alternative C in long-term and Dry and Critical water year average conditions, when compared to Existing Conditions and the No Project/No Action Alternative. No water management options are included in Existing Conditions. Therefore, when comparing Alternative C with Existing Conditions, the change in management options would always be zero or positive. When comparing Alternative C with the No Project/No Action Alternative, the increase in Project deliveries would reduce the use of management options (conservation, recycling, and desalination) and other supply (local surface water and groundwater, imported non-Project water, baseline recycling and desalination, and transfers).

Table 22-53
Change in M&I Water Supply Deliveries and Costs for the South Coast Hydrologic Region Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative

Analysis Metric	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average			
Total Supply (TAF/Year)	**5,043**	**464**	**23**
Project Delivery	1,440	117	68
Management Options[a]	500	500	-10
Other Supply	3,103	-153	-35
Total Costs (Million $/Year)	**1,698,063**	**362,267**	**-65,559**
Shortage	68,089	-171,177	-41,241
Supply[c]	1,629,974	533,445	-24,319
Dry and Critical Water Year Average[b]			
Total Supply (TAF/Year)	**4,775**	**331**	**56**
Project Delivery	1,199	111	146
Management Options[a]	500	500	-10
Other Supply	3,076	-280	-81
Total Costs (Million $/Year)	**1,884,947**	**378,750**	**-153,798**
Shortage	197,360	-217,620	-105,408
Supply[c]	1,687,587	596,371	-48,390

[a]Management options include conservation, recycling, and desalinization.
[b]Sacramento River 40-30-30 index.
[c]This estimate does not include all water supply-related costs. It includes annual costs that might be affected by alternatives including conveyance, distribution, treatment, and transfers.

Notes:
M&I = municipal and industrial
TAF = thousand acre feet
Costs are presented in 2010 dollars.

When comparing Alternative C with Existing Conditions, supply costs would be expected to increase in the South Coast hydrologic region in long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. This increase in supply cost would overwhelm any decrease in shortage costs, causing total costs to increase. When comparing Alternative C with the No Project/No Action Alternative, the additional Project deliveries would reduce the use of management options and other supply, reducing supply costs. The accompanying reduction in shortage costs would decrease total costs.

When comparing Alternative C and Existing Conditions in the Extended Service Area outside of the San Francisco Bay – South and South Coast hydrologic regions, Project water deliveries would be expected to increase in long-term and Dry and Critical water year average conditions, excluding the Delta. When comparing Alternative C to the No Project/No Action Alternative, Project deliveries would increase in long-term and Dry and Critical water year average conditions (Table 22-54).

Table 22-54
Change in M&I Water Supply Deliveries and Costs Modeled in OMWEM Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative

Water Delivery Region	Analysis Metric					
	Average Annual Project Water Delivery (TAF)			Average Annual Shortage and Supply Cost[c] (Thousand $)		
	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average						
Delta	56	3	2	9,222	3,571	-519
Bay Area[a]	54	7	2	5,671	5,642	-189
Central Coast	47	2	2	1,358	1,303	-1,334
Sacramento Valley	23	0	0	4,415	3,252	-138
San Joaquin	104	2	5	1,592	757	-29
Southern California[b]	266	20	14	13,629	2,727	-8,866
Dry and Critical Water Year Average[d]						
Delta	45	0	4	18,170	8,154	-1,252
Bay Area[a]	39	3	3	11,263	11,183	-476
Central Coast	28	1	4	3,758	3,604	-3,691
Sacramento Valley	21	0	0	10,761	7,829	-356
San Joaquin	83	7	10	2,796	1,154	-125
Southern California[b]	218	10	32	23,930	2,491	-23,858

[a]The results shown here are for San Benito County only.

[b]The results shown here exclude South Coast Hydrologic Area, which is shown separately.

[c]This estimate does not include all water supply-related costs. It includes annual shortage costs and supply costs that might be affected by alternatives, including transfers, groundwater pumping, or other water management options.

[d]Sacramento River 40-30-30 index.

Notes:

M&I = municipal and industrial
OMWEM = Other Municipal Water Economics Model
TAF = thousand acre feet

Costs are presented in 2010 dollars.

When comparing Alternative C and Existing Conditions, shortage and water supply costs would be expected to increase in both long-term and Dry and Critical water year average conditions. The increase in supply costs would result from population and real energy price increases that occur in future conditions. When comparing Alternative C to the No Project/No Action Alternative, shortage and water supply costs would decrease (Table 22-54). The increase in Project deliveries would reduce shortage and water supply costs.

The expected change in salinity-related costs in the Extended Study Area attributable to Alternative C operations relative to Existing Conditions and the No Project/No Action Alternative is shown in Table 22-55. Discussion in this section focuses on the change in salinity costs specific to regions with modeled salinity costs.

Table 22-55
Change in Water Supply Salinity Costs Associated with Implementation of Alternative C when Compared to Existing Conditions and the No Project/No Action Alternative[a]

Water Delivery Service Area	Analysis Metric	Alternative C	Change from Existing Conditions	Change from the No Project/No Action Alternative
Long-Term Water Year Average				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	232.0	-15.2	-7.8
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	58.6	-12.4	-2.0
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	251.6	-16.8	-2.3
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$534.2	-$12.9
Contra Costa and Santa Clara Water Districts		N/A	$112.4	-$1.5
Dry and Critical Water Year Average[b]				
Metropolitan Water District of Southern California	Long-Term Average Export-Weighted Annual TDS (mg/L)	295.1	-26.8	-17.9
Contra Costa and Santa Clara Water Districts	Average Annual Chloride (mg/L)	80.4	-23.6	-3.5
Contra Costa and Santa Clara Water Districts	Long-Term Average Export-Weighted Annual TDS (mg/L)	272.7	-26.6	-2.7
Metropolitan Water District of Southern California	Average Annual Cost (Million $)	N/A	$539.6	-$23.5
Contra Costa and Santa Clara Water Districts		N/A	$109.8	-$1.9

[a]Results include some damages related to agricultural production in Metropolitan Water District of Southern California's Service Area.

[b]Sacramento River 40-30-30 index.

Notes:

mg/L = milligrams per liter
N/A = not applicable
TDS= total dissolved solids

Costs are presented in 2010 dollars. The Lower Colorado River Basin Water Quality Model was used for the Metropolitan Water District of Southern California service area and the South Bay Water Quality model was used for the Contra Costa and Santa Clara Water District service areas.

When comparing Alternative C with Existing Conditions, long-term average export-weighted annual TDS and chloride would be expected to decrease in long-term and Dry and Critical water year average conditions across service areas. However, average annual costs would increase. This increase is expected due to population increases that occur in future conditions. When comparing Alternative C with the No Project/No Action Alternative, long-term average export-weighted annual TDS and chloride would decrease in long-term and Dry and Critical water year average conditions in the Metropolitan Water District of Southern California and Contra Costa and Santa Clara Water District service areas. The improvement in water quality would reduce damages in long-term and Dry and Critical water year average conditions.

When comparing Alternative C to Existing Conditions, expected changes in M&I water use economics impacts would result from a combination of Alterative C and underlying changes in population and the real cost of energy, impacting water system operation costs. Similar to that described for Alternative A, the change that would occur solely as a result of Alternative C, i.e., decreases in total costs, is not considered an adverse effect on M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on M&I water use economics is expected, when compared to Existing Conditions.

When comparing Alternative C to the No Project/No Action Alternative, the expected increase in water supply and quality would decrease total costs, which is not considered an adverse effect on the M&I water use economics in the Extended Study Area. Therefore, a **less-than-significant impact** on water use economics is expected, when compared to the No Project/No Action Alternative.

22.3.8.2 Secondary Study Area – Alternative C

The operational effects within the Secondary Study Area are included in the analysis of the Extended Study Area and/or Primary Study Area, similar to that described for Alternative A.

22.3.8.3 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Socio-1: Substantial Adverse Effects on Regional Economics

The regional economic effects on employment and income in the Primary Study Area were evaluated during Project construction, operation, and maintenance. Changes are shown relative to Existing Conditions and the No Project/No Action Alternative. There is no difference between Existing Conditions and the No Project/No Action Alternative model used in the analysis. The expected effects of construction, operation, and maintenance expenditures to employment and income are shown in Table 22-56.

The Project footprint and related facilities, such as roads and utilities, would remove some existing agricultural land from production, so the effects on employment and income would be negative. Some agricultural land removed from production would only be temporary, and restored to its original use following the construction period.

Table 22-56
Temporary Change in Regional Employment and Income Associated with Implementation of Alternative C when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[c]	Direct	Total[c]
Agriculture	-636	-1,242	-44.0	-62.2
Land Acquisition	625	717	14.7	17.5
Construction	22,219	49,441	106.9	693.3
Total	**22,208**	**48,916**	**77.6**	**648.6**

[a]Average annual effect based on entire period of construction. The duration of each impact will vary.
[b]IMPLAN results are changes relative to Existing Conditions and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 2012a.

Alternative C would increase economic activity related to land acquisition in the Primary Study Area. This regional economic impact would be temporary, occurring 12 to 18 months prior to construction. The regional economic effects to employment and income in the Primary Study Area from land acquisition are reported in Table 22-56.

The expected permanent effects to employment and income from operation and maintenance are shown in Table 22-57. Alternative C would also increase recreational opportunities in the Primary Study Area. The increased recreational expenditures would affect employment and income. The regional economic effects to employment and income in the Primary Study Area from the increase in recreational expenditures are reported in Table 22-57.

Table 22-57
Permanent Change in Regional Employment and Income Associated with Implementation of Alternative C when Compared to the No Project/No Action Alternative[a,b]

Impact	Labor Income (Thousand $)		Annual Jobs	
	Direct	Total[c]	Direct	Total[c]
Recreation	504	608	20.8	23.7
Agriculture - Permanent	-204	-381	-4.7	-9.9
Operation	1,750	2,120	35.0	45.7
Total	**2,050**	**2,347**	**51.1**	**59.5**

[a]Average annual effect based over life of Alternative C.
[b]IMPLAN results are changes relative to Existing Condition and the No Project/No Action Alternative.
[c]Includes direct, indirect, and induced effects (defined in Appendix 22C).

Note:
Income is reported 2010 dollars.

Source: Pavich, 20112a.

Total employment and income in the Primary Study Area would increase as a result of construction, operation, land acquisition, and a change in agricultural production and recreational opportunities. The increase in employment and income would not be considered an adverse effect on the regional economy of the Primary Study Area. Therefore, a **less-than-significant impact** on regional economics is expected, similar to that described for Alternative A.

Impact Socio-2: Substantial Adverse Effects on Population and Housing

Population

Construction and operation of Alternative C would require an estimated annual average of 107 and 35 workers, respectively, with a maximum of 60 daily workers for operation. It is anticipated that approximately 50 percent of the construction jobs would be filled from within the existing two-county labor force. However, construction may require specialized worker skills not readily available in the local labor pool. As a result, it is anticipated that some of the non-local workers would be imported from outside the two-county region.

Considering the multi-year duration of construction, it is anticipated that 20 percent of the imported workers would relocate to the two-county region, adding to the local population. It is anticipated that all of the workers required for operation would relocate to the two-county region. Similar to that described for Alternative A, this additional population from construction and operation would constitute a minor increase in the total 2020 projected regional population of 64,605, and would not pose a burden on local public services, utilities, or infrastructure. Therefore, impacts are considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Housing

Alternative C construction, operation, and maintenance impacts to housing conditions within the Primary Study Area would be the same as described for Alternative A.

Impact Socio-3: Substantial Adverse Effects on Local Government Fiscal Conditions

Alternative C construction, operation, and maintenance impacts to local government fiscal conditions within the Primary Study Area would be the same as described for Alternative A.

Impact Socio-4: Substantial Adverse Effects on Recreation Economics

Alternative C would provide recreational opportunities within the Primary Study Area. Table 22-58 shows the estimated number of visitors to Sites Reservoir if Alternative C is implemented. Also included are recreation expenditures attributable to the portion of visitors outside the Primary Study Area. This recreation expenditure information is used to assess the effects on regional economics, i.e., the impact on employment and income. Anticipated total recreation visitation would be more than 370,000 annual visits, increasing recreation expenditures from outside the Primary Study Area by more than $3 million.

Increased levels of recreation at the Sites Reservoir would increase recreation expenditures in the Primary Study Area. An increase in recreation expenditures is not considered an adverse effect on the recreation economy of the Primary Study Area. Therefore, a **less-than-significant impact** on recreation economics is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 22-58
Estimated Sites Reservoir Recreation Visitation and Expenditures Associated with Implementation of Alternative C*

Activity / Spending Category	Alternative C	
	Visits (Recreation Visitor Days)	**Associated Non-Local Spending**
Shore fishing	32,508	$222,386
Boat fishing	16,815	$115,027
Picnicking	85,941	$716,409
Sightseeing	73,984	$626,843
Swimming / beach use	84,447	$703,949
Walking	10,836	$77,422
Bicycling	4,858	$34,706
Boating / water-skiing	58,291	$485,912
Other	2,989	$24,919
Total	**370,669**	**$3,007,573**

*Based on long-term water year conditions.

Note:

Costs are presented in 2010 dollars. Spending attributed to reservoir-recreation only; the analysis does not account for changes in recreation spending attributed to river-based recreation.

Source: Pavich, 2012b.

Impact Socio-5: Substantial Adverse Effects on Agricultural Economics

Construction of Alternative C would convert land from existing agricultural uses to uses that include Project facility footprints, construction staging areas, temporary and permanent roads, utilities, and open space undeveloped lands.

Changes in crop acreage were used to describe the associated changes in economic values. Table 22-59 summarizes the expected changes in acreage and value of agricultural production that would result in the Primary Study Area as a result of Alternative C construction. Changes are shown relative to Existing Conditions and the No Project/ No Action Alternative; by aggregate crop category (agricultural resources do not differ between Existing Conditions and the No Project/No Action Alternative).

Total value of crop production in the Primary Study Area would be expected to decline on average by $7.1 million per year during the Project construction period, and by $1.5 million per year during Project operation. Total crop acreage would decline by approximately 4,500 acres during Project construction (temporary change) and 26,200 acres during Project operation (permanent change). The majority of the decrease in crop acreage during construction would be associated with rice and almost all of the decrease in crop acreage during Project operation would be associated with rangeland.

Alternative C may also affect production costs on lands even if revenues are largely unaffected. Costs could be associated with operational constraints and longer travel times due to Project construction. Construction designs and costs have provided for such effects in two ways. In most cases, affected lands fall within the Project facilities footprint, and are included in the agricultural acreage and value of production described elsewhere in this chapter. For potentially affected lands not included in the facilities footprint, construction costs include temporary and permanent roads and other facilities as needed to support agricultural production. There could be some additional travel time and other costs associated with using these facilities, but such costs are not environmental impacts requiring mitigation.

Table 22-59
Change in Crop Acres and Value of Agricultural Production Associated with Implementation of Alternative C when Compared to Existing Conditions and No Project/No Action Alternative

Analysis Metric	Alternative C Baseline[b]	Change from Existing Conditions and No Action Alternative	
		Temporary[c]	Permanent[c]
Total Crop Acreage (Thousand acres)[a]	**889.3**	**-4.5**	**-26.2**
Rice	247.2	-3.1	-0.2
Almonds	109.4	-0.1	0.0
Hay and Forage	94.3	-0.2	-0.6
Wheat	22.5	-0.3	-0.1
Tomatoes, Processing	27.9	-0.1	-0.1
Rangeland	388.1	-0.7	-25.3
Total Value of Production (Million $)[a]	**1,047.9**	**-7.1**	**-1.5**
Rice	486.2	-5.8	-0.3
Almonds	359.3	-0.5	-0.1
Hay and Forage	90.9	-0.2	-0.6
Wheat	12.8	-0.2	0.0
Tomatoes, Processing	95.5	-0.4	-0.3
Rangeland	3.1	-0.1	-0.3

[a]Total crop acreage and value of production differ from the sum of individual categories due to rounding.
[b]Permanent impacts of Alternative A.
[c]Temporary impacts are a result of Project construction. Permanent impacts are a result of Project operation.

Note:
Value of production is based on prices received by farmers, in 2010 dollars.

Source: Pavich, 2012c.

Loss of investments in production facilities would occur as a result of facilities construction. The value of structures and equipment potentially affected would vary widely across parcels. Much of the equipment is portable (e.g., machinery, tools, portable sprinkler pipe), and could be sold or used on other lands. Shop and storage buildings and permanent irrigation and drainage equipment may have little or no salvage value. The negotiated purchase of lands for the conveyance and associated facilities would compensate for salvage value accordingly. According to Cooperative Extension cost of production studies, permanent structures, irrigation systems, and drainage systems can represent a wide range in investment, from less than $100 per acre for field and vegetable crops up to more than $3,000 per acre for some orchards (UCCE, 2008 and 2011)). Most of these facilities would not be new, so their depreciated values would be substantially lower.

Land improvements, including orchards, would also be considered during negotiations for land purchases. Typical investments required to bring permanent crops into production were described in Section 22.2. Forage crops, such as irrigated pasture and alfalfa, would require an establishment cost of approximately $400 per acre. The depreciated values of the growing stock could be substantially below these establishment costs, depending on the ages of the stands that would be affected.

Construction and operation of Alternative C would reduce the total value of agricultural production in the Primary Study Area. DWR and Reclamation would provide compensation to property owners for the fair market value of any property acquired through eminent domain for the Project. Similar to that described for Alternative A, the expected decrease in the total value of agricultural production would be less than five percent of the total value of agricultural production in the Primary Study Area. Therefore, a **less-than-significant impact** is expected to the agricultural economy in the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Socio-6: Substantial Adverse Effects on M&I Water Use Economics

Refer to the **Impact Socio-6** discussion for the Extended Study Area. That discussion also applies to the Primary Study Area.

22.4 Mitigation Measures

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

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23. Environmental Justice

23.1 Introduction

This chapter describes the ethnic and income characteristics of the populations within the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA, 2013).

The regulatory setting for environmental justice is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Specifically, the chapter discusses whether the alternatives would have disproportionately high and adverse human health or environmental effects on minority and/or low-income populations, as defined by State and federal regulations that address environmental justice. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate. Because none were identified for this resource, no mitigation is included in this chapter.

23.2 Environmental Setting/Affected Environment

23.2.1 Introduction

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 Federal Register No. 32), was signed on February 11, 1994, by President Clinton. EO 12898 requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations (Federal Register, 1994).

The intent of EO 12898 is to assess potential impacts from the implementation of development projects, subject to federal permitting requirements, to confirm that no person in the United States shall, on the basis of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. Where possible, measures should be taken to avoid negative impacts to these communities or mitigate the adverse effects.

The U. S. Census Bureau provides a definition of minority and low-income populations. The term "minority population" includes persons who identify themselves as African American, Asian or Pacific Islander, American Indian or Alaskan Native, or Hispanic (U.S. Census Bureau, 2009a). Race refers to census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, or Central or South American, and other Spanish cultures (Office of Management and Budget, 1997).

According to the Council on Environmental Quality (CEQ), to be considered a minority population, the population of the affected area must either exceed 50 percent minority, or the minority population percentage of the affected area must be meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. To be considered a low-income population, the low-income populations in an affected area should be identified using the annual statistical poverty thresholds from the U.S. Census Bureau. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds (CEQ, 1997). In addition, according to USEPA guidelines, similar to the CEQ, a minority population refers to a minority group that has a population of greater than 50 percent of the affected area's general population; or the minority population percentage of the affected area must be meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (USEPA, 1998).

The U. S. Census Bureau does not provide a specific definition for "low-income." Rather, the term "poverty" is used, and poverty thresholds are established each year for statistical purposes (U.S. Census Bureau, 2009b). The U.S. Department of Health and Human Services issues poverty guidelines each year that are a simplification of the U.S. Census Bureau's poverty thresholds. The guidelines are another version of the federal poverty measure; they are used for administrative purposes (for example, such as determining financial eligibility for certain federal programs) (IRP, 2008).

23.2.2 Extended Study Area

23.2.2.1 Methodology

To characterize the population, race, and ethnicity of the Extended Study Area, data from the U.S. Census Bureau were obtained for each of the 39 counties that are located within that study area. Table 23-1 presents the total population and population breakdown by race and ethnicity for the counties that are located within the Extended Study Area, as well as for the State of California, based on the 2005 to 2009 Census Bureau American Community Survey (U.S. Census Bureau, 2009c).

23.2.3 Secondary Study Area

23.2.3.1 Methodology

To characterize the population, race, and ethnicity of the Secondary Study Area, data from the U.S. Census Bureau were obtained for each of the 22 counties that are located within that study area. Table 23-2 lists the total population and population breakdown by race and ethnicity, based on the 2005 to 2009 Census Bureau American Community Survey (U.S. Census Bureau, 2009c). Fourteen of the 22 counties in the Secondary Study area are also located in the Extended Study Area (Table 23-1), and are not repeated in Table 23-2.

Table 23-1
Race and Ethnicity of the State of California and the Counties that are Located within the Extended Study Area

County	Race and Ethnicity								
	Total Population	Hispanic Origin (of any race)	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other Race	Two or More Races
Alameda[a]	1,457,095	310,688	684,471	187,300	7,720	358,959	10,866	144,998	62,781
Butte[a]	217,917	27,778	181,462	3,498	2,531	8,744	524	10,209	10,949
Calaveras	46,548	4,565	42,113	651	910	673	18	926	1,257
Colusa[b]	21,001	10,663	13,982	241	365	185	62	5,311	855
Contra Costa[a]	1,015,571	226,432	632,590	93,210	4,478	136,379	4,440	101,802	42,672
El Dorado[a]	175,941	20,242	153,780	776	1,431	7,442	137	7,222	5,153
Fresno	890,750	428,139	553,541	45,741	8,824	78,776	1,057	170,379	32,432
Glenn[b]	27,891	9,648	20,120	193	613	863	10	5,025	1,067
Imperial	160,034	121,781	114,021	5,783	2,628	3,334	144	30,164	3,960
Kern	780,953	360,187	504,346	44,601	7,600	29,393	970	165,064	28,979
Kings	146,696	70,992	101,963	11,356	2,221	4,912	132	21,875	4,237
Los Angeles	9,785,295	4,627,543	4,963,235	862,521	51,809	1,276,546	26,956	2,311,733	292,495
Madera	144,794	72,444	112,723	5,901	2,450	2,761	175	15,729	5,055
Merced	242,235	126,272	158,880	9,156	2,405	16,972	545	46,456	7,791
Monterey	404,922	210,808	272,927	13,475	2,753	25,449	1,624	74,823	13,871
Napa	132,173	38,601	105,830	2,516	1,104	7,676	534	10,846	3,667
Nevada	97,063	7,270	89,536	515	1,267	1,287	134	1,904	2,420
Orange	2,976,831	987,175	1,877,058	51,015	14,505	479,750	9,481	467,667	77,354
Placer[a]	332,059	39,178	281,654	4,964	2,945	17,998	854	13,485	10,159
Plumas	20,550	1,527	18,831	216	579	202	6	330	386
Riverside	2,036,304	879,799	1,308,393	124,960	19,110	106,871	5,478	396,988	74,504
Sacramento[a]	1,375,605	271,667	845,626	138,418	13,670	184,568	11,487	118,992	62,754
San Benito	54,752	28,809	35,835	725	873	1,392	8	12,940	2,979

Table 23-1
Race and Ethnicity of the State of California and the Counties that are Located within the Extended Study Area

County	Race and Ethnicity								
	Total Population	Hispanic Origin (of any race)	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other Race	Two or More Races
San Bernardino	1,986,635	925,914	1,215,076	176,125	20,325	116,126	5,552	373,783	79,648
San Diego	2,987,543	906,922	2,124,247	151,261	21,272	304,192	13,689	260,556	112,326
San Joaquin	664,641	241,865	402,861	48,842	6,172	91,275	2,998	78,984	33,509
San Luis Obispo	262,149	49,374	223,498	5,088	2,416	8,286	430	14,407	8,024
Santa Barbara	402,025	155,814	306,777	7,647	3,967	17,887	804	50,912	14,031
Santa Clara[a]	1,729,378	444,128	899,076	44,401	9,172	522,847	6,247	186,518	61,117
Santa Cruz	251,398	72,956	213,220	2,445	1,095	9,674	430	15,520	9,314
Shasta[a]	179,387	13,854	158,210	1,785	4,656	4,662	272	3,579	6,223
Solano[a]	406,461	89,411	214,951	58,483	2,852	56,658	3,507	45,933	24,077
Stanislaus	505,165	196,701	376,806	14,721	5,176	26,318	2,769	61,589	17,786
Sutter[a]	90,731	24,487	60,221	1,673	1,134	11,330	224	10,890	5,259
Tehama[a]	60,601	12,141	49,548	526	1,221	817	60	6,227	2,202
Tulare	416,299	235,858	316,499	6,232	4,726	14,396	385	62,312	11,749
Tuolumne	55,761	5,536	48,531	1,319	850	537	158	2,038	2,328
Ventura	792,313	295,566	546,998	15,787	9,330	52,122	1,945	137,822	28,309
Yolo[a]	192,974	54,933	131,392	4,587	2,040	22,304	1,178	21,837	9,636
California	36,308,527	13,102,161	22,258,042	2,249,404	283,031	4,473,292	132,535	5,639,234	1,272,989

[a]These counties are located in both the Secondary and Extended study areas.

[b]These two counties are located in all three study areas (Primary, Secondary, and Extended).

Source: U.S. Census Bureau, 2009c.

Table 23-2
Race and Ethnicity of the State of California and the Counties that are Located within the Secondary Study Area*

County	Race and Ethnicity								
	Total Population	Hispanic Origin (of any race)	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other Race	Two or More Races
Del Norte	28,729	4,630	21,281	987	1,466	836	181	2,222	1,756
Humboldt	129,003	10,705	107,090	1,387	6,881	2,779	448	3,778	6,640
Marin	246,711	33,639	199,929	7,829	928	13,962	562	16,950	6,551
San Francisco	797,271	113,107	429,829	51,850	3,765	250,146	3,408	32,133	26,140
San Mateo	701,886	161,800	425,806	22,455	2,477	167,397	9,647	49,032	25,072
Sonoma	464,218	103,650	375,358	7,105	5,027	18,029	1,008	42,841	14,850
Trinity	13,922	705	12,391	69	204	136	35	208	879
Yuba	70,906	15,929	48,861	1,472	1,399	4,956	154	8,440	5,624

*See Table 23-1 for 14 additional counties that are located within the Secondary Study Area.

Source: U.S. Census Bureau, 2009c.

23.2.4 Primary Study Area

23.2.4.1 Methodology

To characterize the population, race, ethnicity, income, poverty, unemployment, and housing characteristics of the Primary Study Area, data from the U.S. Census Bureau were obtained for the two counties that are located within that study area.

23.2.4.2 Race and Ethnic Character

Table 23-3 lists the population and percent minority population for Glenn and Colusa counties, as well as for the State of California. It also provides the race breakdown and Hispanic or Latino ethnicity percentages (U.S. Census Bureau, 2009c).

Table 23-3
Race and Ethnicity 2005-2009 Five-Year Estimate - Glenn and Colusa Counties and the State of California

Parameter	Glenn County	Colusa County	California
Total Population	27,891	21,001	36,308,527
Percent Minority[a]	27.9	33.4	38.7
White			
Number	20,120	13,982	22,258,042
Percent	72.0	66.6	61.3
Black or African American			
Number	193	241	2,249,404
Percent	0.69	1.1	6.2
American Indian and Alaska Native[b]			
Number	613	185	283,031
Percent	2.2	1.7	0.78
Asian			
Number	863	185	4,473,292
Percent	3.1	0.88	12.3
Native Hawaiian and Other Pacific Islander			
Number	10	62	132,535
Percent	0.04	0.3	0.37
Some Other Race			
Number	5,025	5,311	5,639,234
Percent	18.0	22.1	15.5
Two or More Races			
Number	1,067	855	1,272,989
Percent	3.8	4.0	3.5
Hispanic or Latino (any race)			
Number	9,648	10,663	13,102,161
Percent	34.6	50.17	36.1

[a]Minority population was calculated by subtracting the white population parameter from the total county or state population numbers to conservatively estimate minority population and avoid double-counting mixed-race individuals.

[b]The tribes known to be present in the Primary Study Area include the Hill and River Patwin and, to a lesser extent, in areas belonging to the Nomlaki and the Konkow Maidu.

Source: U.S. Census Bureau, 2009c.

As shown in Table 23-3, the Hispanic population in Colusa County is just over the 50 percent threshold (50.1 percent) indicating that a majority of the County population identifies itself as a minority population. For Glenn County and the State of California, none of the minority population parameters approach the 50 percent threshold. A review of the U.S. Census blocks in the vicinity of all proposed Project facilities within the Primary Study Area was conducted. This review confirmed that the Primary Study Area is sparsely populated. It further confirmed that all Project facilities would be located in primarily areas that are unpopulated or have less than a 25 percent minority population. The exception to this is the easternmost three miles of the proposed Delevan Transmission Line and Delevan Pipeline alignments, in which 75.1 to 100 percent of the population is identified as being minority. In addition, all Project facilities would be located in areas where 25 percent or less of the population is identified as low income.

23.2.4.3 Income, Poverty, Unemployment, and Housing Characteristics

Table 23-4 provides income, poverty, unemployment, and housing data for Glenn and Colusa counties, as well as for the State of California.

Table 23-4
Income, Poverty, Unemployment, and Housing 2005-2009 Five-Year Estimate - Glenn and Colusa Counties and the State of California

Parameter	Glenn County	Colusa County	California
Median Family Income	$47,618	$51,637	$53,760
Per Capita Income	$19,257	$20,381	$22,973
Families Below Poverty Level (#/%)	566/2%	2,520 /12.2%	110,663/7.3%
Individuals Below Poverty Level (#/%)	390/14.2%	9,280/15.7%	612,370/10.6%
Percent Unemployed	4.2	8.2	6.2
Housing: 1.01 or More Occupants per Room* (%)	3.6	3.7	5.1
Housing: Lacking Complete Plumbing Facilities (%)	0.9	0.4	0.5

*This parameter is an indicator of how crowded the living facilities are.

Note:

It is noted that the 2012-2013 Community Action Plan for the Community Services Block Grant for Colusa, Glenn, and Trinity counties reports these poverty and unemployment rates: 2010 poverty rate in Colusa County of 15.7 percent and Glenn County of 17.8 percent; and April 2011 unemployment rate in Colusa County of 21 percent and in Glenn County of 16.5 percent (Community Action Partnership, 2011).

Source: U.S. Census Bureau, 2009c.

As shown in Table 23-4[1], both counties have lower median family and per capita incomes than the State of California. The percentages of individuals living below the poverty level are higher in both counties when compared to the State; however, the percentage of families living below the poverty level in Glenn County is lower than Colusa County and the State. The unemployment rate in Colusa County is higher than the State, and Glenn County's unemployment rate is lower than the State. In addition, the percentage of people who are living together in individual rooms is lower in both counties than the State. The percentage of homes that lack plumbing facilities in Glenn County is greater than the State, and the percentage in Colusa County is less than the State.

[1] It is acknowledged that there are likely undocumented workers within Glenn and Colusa counties that are not included in U.S. Census Bureau data.

23.3 Environmental Impacts/Environmental Consequences

23.3.1 Regulatory Setting

Environmental justice is regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

23.3.1.1 Federal Plans, Policies, and Regulations

- Executive Order 12898 (EO 12898) regarding "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (1994)
- Council on Environmental Quality Guidance (1997)
- U.S. Department of the Interior Environmental Compliance Memorandum No. ECM 95-3 (National Environmental Policy Act [NEPA] Responsibilities Under the Environmental Justice Policy, 1995)
- U.S. Department of the Interior Environmental Justice Strategic Plan (1995)
- U.S. Environmental Protection Agency Office of Environmental Justice's Environmental Justice Implementation Plan (1997)
- Title VI of the Civil Rights Act of 1964
- U.S. Environmental Protection Agency Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (1998)

23.3.1.2 State Plans, Policies, and Regulations

- Delta Vision Strategic Plan (October 2008)
- Senate Bill 115 (Solis) (1999)
- California Government Code Section 65040.12
- California State Lands Commission Environmental Justice Policy (October 1, 2002)
- California Public Resources Code Sections 71110 to 71116
- CALFED Environmental Justice Statement (as declared in August 2000, Record of Decision [ROD] CALFED Bay Delta Program Programmatic EIS/EIR)

23.3.1.3 Regional and Local Plans, Policies, and Regulations

- Tehama County General Plan
- Glenn County General Plan
- Colusa County General Plan

23.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* does not address environmental justice or minority and low-income populations specifically. Its Mandatory Findings of Significance Question (c) is relevant to the general population, as follows:

- Does the Project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

EO 12898 specifies that, “each federal agency shall analyze the environmental effects, including human health, economic, and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA.” For the purposes of this analysis, an alternative would result in a significant environmental justice impact if it would result in the following:

- A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures.

Potential adverse environmental impacts associated with this type of major infrastructure project include construction-, operation-, or maintenance-related nuisance effects (e.g., traffic, noise, dust, and/or hazards); and construction, operation, or maintenance effects on local employment opportunities.

23.3.3 Impact Assessment Assumptions and Methodology

23.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to minority and low-income populations:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.

23.3.3.2 Methodology

The analysis characterizes the distributional patterns of minority and low-income populations in the Primary Study Area and describes whether Project impacts to minority and/or low-income populations would be disproportionately high and adverse.

In accordance with CEQ and USEPA guidelines established to assist federal and State agencies, the first step undertaken in this environmental justice analysis was to define minority and low-income populations. For this analysis, a minority population was defined to be present in the Primary Study Area if: (1) the minority population of the affected area exceeds 50 percent, or (2) the minority population percentage of the affected area is at least 10 percentage points greater than that of the general population in the State. By the same rule, a low-income population exists in the Primary Study Area if it consists of 50 percent or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is significantly greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The second step undertaken in this environmental justice analysis was to determine if a “high and adverse” impact would occur. The CEQ guidance indicates that, when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of impact “are significant or above generally accepted norms.”

The final step undertaken in this analysis was to determine if the impact on the minority or low-income population would be disproportionately high and adverse. The CEQ includes a non-quantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population.

23.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

23.3.5 Impacts Associated with the No Project/No Action Alternative

23.3.5.1 Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, when evaluated pursuant to NEPA, and their potential for environmental justice impacts has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on a minority and/or low-income population, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to result in more minority and/or low-income people living throughout the three study areas. The projects that are included in the No Project/No Action Alternative would already have been in place for most of the Project analysis period; therefore, the future population (including its minorities and low-income population) that chooses to relocate near the projects included in the No Project/No Action Alternative would not experience new impacts and **there would not be a substantial adverse effect**, when compared to Existing Conditions.

In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **there would not be a substantial adverse effect** on a minority and/or low-income population within that study area, when compared to Existing Conditions.

23.3.6 Impacts Associated with Alternative A

23.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts

There would be no direct Project-related construction or maintenance occurring within the CVP and SWP service areas of the Extended Study Area. As a result, there would be no traffic, noise, dust, hazards, and/or socioeconomic effects in the Extended Study Area that would affect a minority and/or low-income population. Therefore, there would be **no impact** on a minority and/or low-income population, when compared to Existing Conditions and the No Project/No Action Alternative.

Improvement in surface water supply reliability for agricultural, municipal, and industrial users, and the provision of an alternate Level 4 water supply source for wildlife refuge users resulting from Project operation would reduce the need for extracting groundwater and/or provide some additional applied water for deep percolation recharge of the aquifer system. Operation at San Luis Reservoir would be altered to accommodate Project operation, which would result in more frequent and larger surface water elevation fluctuations at the reservoir than currently occurs there. These operational changes would not have a disproportionately high or adverse impact on a minority or low-income population, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

23.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts

There would be no direct Project-related construction or maintenance occurring at any of the above-listed facilities or areas within the Secondary Study Area. Therefore, **no impact** on a minority and/or low-income population would occur, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operational activities would result in improved surface water storage in reservoir facilities within the Secondary Study Area, and also changes to the flow regime of the rivers, creeks, and bypasses within that area. These changes are not expected to result in substantial increases in the amount of water (surface or groundwater) that would be available to people (including minority and/or low-income populations) residing within the Secondary Study Area. Additionally, changes in flow regime or surface water elevations would not result in traffic, noise, air quality, hazards, and/or socioeconomic impacts to people (including minority and/or low-income populations). Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump Installation at the Red Bluff Pumping Plant

Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing pump bay at the Red Bluff Pumping Plant. The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the removal of sediment from the existing GCID Canal and Red Bluff Pumping Plant intakes. Neither of these activities would result in traffic, noise, air quality, hazards, and/or socioeconomic impacts to people (including minority and/or low-income populations) due to the facilities' locations away from residences and businesses (e.g., they are separated from the Red Bluff Pumping Plant construction site by streets and an elevated railroad track). There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

23.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Env Jus-1: A Disproportionate Share of an Adverse Impact (such as Traffic, Noise, Dust, Hazards, and/or Socioeconomic Effects) on a Minority or Low-Income Population, Including the Potential for Minority or Low-Income Populations to be Disproportionately Affected by Multiple Adverse Exposures Impacts

Minority Population

Project construction impacts would occur during the defined construction period at each Project facility. The distribution and location of minority population relative to all Project facility locations is shown on the figures included in Appendix 23A. Construction of the proposed Sites Reservoir would require the demolition of all existing structures within the reservoir inundation area and the surrounding Project Buffer, and the relocation of all residents within those boundaries. Sites Reservoir would be located in an area that has a very low population; many areas of the reservoir footprint are unpopulated. A total of 26 residences and two mobile homes would be displaced by Sites Reservoir.

In the areas that are populated, most of the reservoir site has 10 percent or less minority population, with a few areas having 10.1 to 25 percent minority population, and a very small area having 25.1 to 50 percent minority population.

All other Project facilities would be located in areas classified as being unpopulated, or having 25 percent or less minority in areas that have population, except for the easternmost three miles of the proposed Delevan Transmission Line and Delevan Pipeline, in which the area is classified as being 75.1 to 100 percent minority (U.S. Census Bureau, 2000). The easternmost three miles of proposed Delevan Transmission Line/Pipeline alignment has one residence in the vicinity. Siting of transmission line towers and pipeline installation would not affect that residence, resulting in **no impact** to residents, and particularly **no disproportionate impact** to a minority population, when compared to Existing Conditions and the No Project/No Action Alternative.

Low-Income Population

The distribution and location of low-income population relative to all Project facility locations is shown on the figures included in Appendix 23B. Sites Reservoir would be located in an area that is classified as primarily 10.1 to 25 percent low income, with a small area that is 0 to 10 percent low income (U.S. Census Bureau, 2000). All Project facilities, other than Sites Reservoir, would be located in areas classified as being 10.1 to 25 percent low income (U.S. Census Bureau, 2000). The areas where Project facilities would be constructed do not have high percentages of the two counties' populations or of low-income populations. Therefore, there would be **no impact** to residents, and particularly **no disproportionate impact** to a low-income population, from construction, operation, or maintenance in the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Hispanic Population

Although the Hispanic population in Colusa County is greater than 50 percent of the County's population, as shown in Table 23-3, the County's population is low and widely distributed. As discussed above, the areas where Project facilities would be constructed do not have high percentages of the two counties' populations, or of minorities or low-income populations. Along the portion of the Delevan Transmission Line/Pipeline alignment, which is classified as being high minority percentage by the U.S. Census Bureau, there is one residence, which would not be affected during Project construction, operation, or maintenance. Therefore, there would be **no impact** to residents at this location within the Primary Study Area, and particularly **no disproportionate impact** to a minority or low-income population, from construction, operation, or maintenance in the Primary Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Job and Recreational Opportunities

In addition, this alternative has the potential to create jobs for minorities who have the appropriate construction, operation, or maintenance skillset for the Project. Further, this alternative would increase recreational opportunities in Glenn and Colusa counties for all recreationists, including minority and low-income populations, resulting in a **potentially beneficial effect**, when compared to Existing Conditions and the No Project/No Action Alternative.

23.3.7 Impacts Associated with Alternative B

23.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to disproportionate adverse impacts on a minority or low-income population (**Impact Env Jus-1**), would be the same as described for Alternative A for the Extended and Secondary study areas.

23.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to a minority or low-income population:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road

- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprint or construction disturbance area of Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge; the Road Relocations and TRR Pipeline Road; the Delevan Transmission Line; and the Electrical Distribution Lines would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. However, these differences in the size of the footprint or alignment of the construction disturbance area would require the same type of construction, operation, and activities as was described for Alternative A. They would, therefore, have the same impact on a minority and/or low-income population (**Impact Env Jus-1**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities, and associated impacts on a minority and/or low-income population (**Impact Env Jus-1**) as described for Alternative A.

23.3.8 Impacts Associated with Alternative C

23.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to disproportionate adverse impacts on a minority or low-income population (**Impact Env Jus-1**), would be the same as described for Alternative A for the Extended and Secondary study areas.

23.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to a minority or low-income population:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant

- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to a minority or low-income population (**Impact Env Jus-1**) as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area, Sites Reservoir Dams, and South Bridge; Road Relocations and TRR Pipeline Road; and the Electrical Distribution Lines is the same as described for Alternative B. These facilities would require the same construction, operation, and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to a minority or low-income population (**Impact Env Jus-1**) as described for Alternative B.

The boundary of the Project Buffer would be the same for all alternatives, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on a minority or low-income population (**Impact Env Jus-1**) as described for Alternative A.

23.4 Mitigation Measures

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

23.5 References

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24. Air Quality

24.1 Introduction

This chapter describes the air quality setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas[1] are provided in Chapter 1 Introduction.

The regulatory setting for air quality is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the counties in the Primary Study Area, with greatest emphasis on the existing air quality conditions and potential Project-related emissions and impacts in Glenn and Colusa counties. Air quality conditions and potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

24.2 Environmental Setting/Affected Environment

24.2.1 Extended Study Area

The California Air Resources Board (ARB) and the U.S. Environmental Protection Agency (USEPA) use ambient air quality monitoring data to determine whether geographic areas throughout the State achieve the standards that regulators have established for criteria pollutants[2]. Areas that achieve standards are designated as attainment areas[3], and areas that do not achieve standards are nonattainment areas[4], in accordance with the National Ambient Air Quality Standards (NAAQS)[5] and California Ambient Air Quality Standards (CAAQS)[6]. Table 24-1 lists the NAAQS and CAAQS.

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[1] For this resource, the Extended Study Area consists of 39 counties that are located in the following air basins: San Francisco Bay Area, Sacramento Valley, Mountain Counties, San Joaquin Valley, Salton Sea, Mojave Desert, South Coast, North Central Coast, San Diego County, Lake Tahoe, and South Central Coast. The Secondary Study Area consists of 22 counties that are located in the Sacramento Valley Air Basin, San Francisco Bay Area Air Basin, Mountain Counties Air Basin, and North Coast Air Basin. The Primary Study Area consists of portions of the Sacramento Valley Air Basin (SVAB), in Glenn and Colusa counties only.

[2] Criteria Pollutant: An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set (ARB, 2010). The criteria pollutants are ozone (O_3), carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), and lead.

[3] Attainment Area: A geographic area considered to have air quality as good as or better than the national and/or State ambient air quality standards (NAAQS and CAAQS, respectively) (USEPA, 2006).

[4] Nonattainment Area: A geographic area identified by the USEPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant (ARB, 2010).

[5] NAAQS: Standards established by USEPA that apply to ambient air throughout the country (USEPA, 2006).

[6] California Ambient Air Quality Standard (CAAQS): A legal limit that specifies the maximum level and time of exposure in the ambient air for a given air pollutant and which is protective of human health and public welfare (Health and Safety Code section 39606b). CAAQSs are recommended by the California Office of Environmental Health Hazard Assessment and adopted into regulation by the ARB. CAAQS are the standards which must be met per the requirements of the California Clean Air Act (ARB, 2010).

Table 24-1
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards (CAAQS)[a]	National Standards (NAAQS)[b]	
			Primary[c]	Secondary[d]
Ozone	8 Hour 1 Hour	0.07 ppm 0.09 ppm	0.075 ppm —	0.075 ppm —
Carbon monoxide	8 Hour 1 Hour	9.0 ppm 20 ppm	9 ppm 35 ppm	— —
Nitrogen dioxide	Annual Arithmetic Mean 1 Hour	0.30 ppm 0.18 ppm	0.053 ppm 100 ppb	0.053 ppm —
Sulfur dioxide[e]	Annual Arithmetic Mean 24 Hour 3 Hour 1 Hour	— 0.04 ppm — 0.25 ppm	0.030 ppm 0.14 ppm — 75 ppb	— — 0.5 ppm —
PM_{10}	Annual Arithmetic Mean 24 Hour	20 μg/m^3 50 μg/m^3	— 150 μg/m^3	— 150 μg/m^3
$PM_{2.5}$[f]	Annual Arithmetic Mean 24 Hour	12 μg/m^3 —	12 μg/m^3 35 μg/m^3	12 μg/m^3 35 μg/m^3
Sulfates	24 Hour	25 μg/m^3	—	—
Lead[g]	30 Day Average Calendar Quarter Rolling 3-Month Average	1.5 μg/m^3 — —	— 1.5 μg/m^3 0.15 μg/m^3	— 1.5 μg/m^3 0.15 μg/m^3
Hydrogen sulfide	1 Hour	0.03 ppm	—	—
Vinyl chloride	24 Hour	0.01 ppm	—	—
Visibility-reducing particles	8 Hour	See Note[h]	—	—

[a]California Ambient Air Quality Standards (CAAQS) for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded.

[b]National Ambient Air Quality Standards (NAAQS), other than ozone, particulate matter, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

[c]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[d]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[e]On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except for areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

[f]On December 14, 2012, USEPA lowered the federal primary $PM_{2.5}$ annual standard from 15.0 micrograms per cubic meter to 12.0 micrograms per cubic meter.

[g]The national standard for lead was revised on October 15, 2008, to a rolling three-month average. The 1978 lead standard (1.5 μg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except for areas designated nonattainment for the 1978 standard, where the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[h]Insufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.

Notes:

ppm = parts per million (by volume)
ppb = parts per billion (by volume)
μg/m^3 = micrograms per cubic meter

Source: ARB, 2012e.

Table 24-2 lists the 39 counties within the Extended Study Area that are designated as nonattainment areas pursuant to the NAAQS and CAAQS. An area may be an attainment area for one pollutant and a non-attainment area for others (USEPA, 2006). The table also lists the air basin and air district for each county. Nonattainment designations are provided for two timeframes: an earlier assessment of nonattainment status based on information available from the USEPA and the State of California in 2009 (the baseline date for the proposed Project), and more current data obtained in 2012.

The relative locations of the air basins, air districts, and proposed Project are shown on Figure 24-1.

Table 24-2
Counties Designated as Nonattainment Areas Pursuant to the National Ambient Air Quality Standards and the California Ambient Air Quality Standards for the Extended Study Area

County	Air Basin	Air District	Federal Nonattainment Designations – NAAQS[c]		State Nonattainment Designations – CAAQS[d]	
			2009 (Source: USEPA, 2009)	2012 (Source: USEPA, 2012a)	2006 (Source: ARB, 2007)	2011 (Source: ARB, 2012b)
Alameda[a]	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Butte[a]	Sacramento Valley	Butte	Ozone and $PM_{2.5}$ in Chico	Ozone and $PM_{2.5}$ in Chico	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Calaveras	Mountain Counties	Calaveras	Ozone	Ozone	Ozone, PM_{10}	Ozone, PM_{10}
Colusa[b]	Sacramento Valley	Colusa			Ozone, PM_{10}	Ozone, PM_{10}
Contra Costa[a]	San Francisco Bay Area	Bay Area	Ozone and $PM_{2.5}$	Ozone and $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
El Dorado[a]	Sacramento Valley, Lake Tahoe, and Mountain Counties	El Dorado	Ozone and $PM_{2.5}$	Ozone and $PM_{2.5}$	Ozone, PM_{10}	Ozone, PM_{10}
Fresno	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Glenn[b]	Sacramento Valley	Glenn			Ozone, PM_{10}	Ozone, PM_{10}
Imperial	Salton Sea	Imperial	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, ($PM_{2.5}$ in Calexico)	Ozone, PM_{10}, ($PM_{2.5}$ in Calexico)
Kern	San Joaquin Valley and Mojave Desert	San Joaquin Valley Unified and Kern	Ozone, $PM_{2.5}$, (PM_{10} in East Kern)	Ozone, $PM_{2.5}$, PM_{10} (in East Kern)	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$ (in San Joaquin Valley air basin)
Kings	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Los Angeles	South Coast and Mojave Desert	South Coast and Antelope Valley	Ozone, $PM_{10}$$PM_{2.5}$,	Ozone, PM_{10} (in South Coast air basin), $PM_{2.5}$, Lead (in South Coast air basin)	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$ (in South Coast air basin); NO_x (in South Coast air basin), Lead (in South Coast air basin)

Table 24-2
Counties Designated as Nonattainment Areas Pursuant to the National Ambient Air Quality Standards and the California Ambient Air Quality Standards for the Extended Study Area

County	Air Basin	Air District	Federal Nonattainment Designations – NAAQS[c]		State Nonattainment Designations – CAAQS[d]	
			2009 (Source: USEPA, 2009)	2012 (Source: USEPA, 2012a)	2006 (Source: ARB, 2007)	2011 (Source: ARB, 2012b)
Madera	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Merced	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Monterey	North Central Coast	Monterey Bay Unified			Ozone, PM_{10}	Ozone, PM_{10}
Napa	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Nevada	Mountain Counties	Northern Sierra	Ozone	Ozone (western Nevada)	Ozone, PM_{10}	Ozone, PM_{10}
Orange	South Coast	South Coast	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$, NO_x
Placer[a]	Sacramento Valley, Lake Tahoe and Mountain Counties	Placer	Ozone in Sacramento Metro	Ozone in Sacramento Metro; $PM_{2.5}$	Ozone, PM_{10} $PM_{2.5}$	Ozone, PM_{10}
Plumas	Mountain Counties	Northern Sierra			Ozone, PM_{10} ($PM_{2.5}$ in Portola Valley)	PM_{10} ($PM_{2.5}$ in Portola Valley)
Riverside	Salton Sea, South Coast, and Mojave Desert	South Coast and Mojave Desert	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$ (in South Coast air basin), NO_x (in South Coast air basin)
Sacramento[a]	Sacramento Valley	Sacramento Metro	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Benito	North Central Coast	Monterey Bay Unified			Ozone, PM_{10}	Ozone, PM_{10}
San Bernardino	Mojave Desert and South Coast	South Coast and Mojave Desert	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Diego	San Diego County	San Diego	Ozone in San Diego	Ozone in San Diego	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Joaquin	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Luis Obispo	South Central Coast	San Luis Obispo		Ozone	Ozone, PM_{10}	Ozone, PM_{10}
Santa Barbara	South Central Coast	Santa Barbara			Ozone, PM_{10}	Ozone, PM_{10}
Santa Clara[a]	San Francisco Bay Area	Bay Area	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$

Table 24-2
Counties Designated as Nonattainment Areas Pursuant to the National Ambient Air Quality Standards and the California Ambient Air Quality Standards for the Extended Study Area

			Federal Nonattainment Designations – NAAQS[c]		State Nonattainment Designations – CAAQS[d]	
County	**Air Basin**	**Air District**	**2009 (Source: USEPA, 2009)**	**2012 (Source: USEPA, 2012a)**	**2006 (Source: ARB, 2007)**	**2011 (Source: ARB, 2012b)**
Santa Cruz	North Central Coast	Monterey Bay Unified			Ozone, PM_{10}	Ozone, PM_{10}
Shasta[a]	Sacramento Valley	Shasta			Ozone, PM_{10}	Ozone, PM_{10}
Solano[a]	Sacramento Valley and San Francisco Bay Area	Yolo-Solano and Bay Area	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Stanislaus	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Sutter[a]	Sacramento Valley	Feather River	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}	Ozone, PM_{10}
Tehama[a]	Sacramento Valley	Tehama		Ozone (Tuscan Buttes area)	Ozone, PM_{10}	Ozone, PM_{10}
Tulare	San Joaquin Valley	San Joaquin Valley Unified	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Tuolumne	Mountain Counties	Tuolumne	Ozone		Ozone	Ozone
Ventura	South Central Coast	Ventura	Ozone	Ozone	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Yolo[a]	Sacramento Valley	Yolo-Solano	Ozone, $PM_{2.5}$	Ozone, $PM_{2.5}$	Ozone, PM_{10}	Ozone, PM_{10}

[a]These counties are located in both the Extended and Secondary study areas.
[b]These two counties (Glenn and Colusa) are located in all three study areas (Extended, Secondary, and Primary).
[c]National Ambient Air Quality Standards
[d]California Ambient Air Quality Standards

Notes:
NO_x = nitrogen oxides.
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.

Source: ARB, 2007 and 2012b; USEPA, 2009 and 2012a.

24.2.2 Secondary Study Area

The Secondary Study Area includes lands within 22 counties. Fourteen of the 22 counties in the Secondary Study Area are also located within the Extended Study Area (Table 24-2), and information for these counties is not repeated in Table 24-3. Table 24-3 lists the remaining counties in the Secondary Study Area that are designated as nonattainment areas pursuant to the NAAQS and CAAQS. The table also lists the air basin and air district for each county.

Table 24-3
Counties Designated as Nonattainment Areas Pursuant to the National Ambient Air Quality Standards and the California Ambient Air Quality Standards for the Secondary Study Area[a]

County	Air Basin	Air District	Federal Nonattainment Designations – NAAQS[b]		State Nonattainment Designations – CAAQS[c]	
			2009 (Source: USEPA, 2009)	2012 (Source: USEPA, 2012a)	2006 (Source: ARB, 2007)	2011 (Source: ARB, 2012b)
Del Norte	North Coast	North Coast			PM_{10}	PM_{10}
Humboldt	North Coast	North Coast			PM_{10}	PM_{10}
Marin	San Francisco Bay Area	Bay Area	Ozone and $PM_{2.5}$	Ozone and $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Francisco	San Francisco Bay Area	Bay Area	Ozone and $PM_{2.5}$	Ozone and $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
San Mateo	San Francisco Bay Area	Bay Area	Ozone and $PM_{2.5}$	Ozone and $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$	Ozone, PM_{10}, $PM_{2.5}$
Sonoma	San Francisco Bay Area and North Coast	Bay Area and Northern Sonoma	Ozone in southern Sonoma County	Ozone and $PM_{2.5}$ in southern Sonoma County	Ozone, PM_{10}, and $PM_{2.5}$ in southern Sonoma County	Ozone, PM_{10}, and $PM_{2.5}$ in southern Sonoma County
Trinity	North Coast	North Coast Unified			Ozone, PM_{10}	PM_{10}
Yuba	Sacramento Valley	Feather River		$PM_{2.5}$	Ozone, PM_{10}	Ozone, PM_{10}

[a]See Table 24-2 for 14 additional counties that are located in both the Extended Study Area and the Secondary Study Area.
[b]National Ambient Air Quality Standards
[c]California Ambient Air Quality Standards

Notes:
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.
Source: ARB, 2007 and 2012b; USEPA, 2009 and 2012a.

24.2.3 Primary Study Area

24.2.3.1 Sacramento Valley Air Basin and County Air Quality Characteristics

Table 24-4 provides the State attainment status for each of the criteria pollutants in the two counties (Glenn and Colusa) that comprise the Primary Study Area. Glenn and Colusa counties are designated as unclassified or attainment for all NAAQS. The pollutants of greatest concern in the Primary Study Area are ozone and the ozone precursors, NO_x and reactive organic gases (ROG[7]), primarily from vehicle and equipment exhaust, and particulate matter (PM_{10}) from soil disturbance and wind erosion (fugitive dust). Glenn and Colusa counties are designated as nonattainment for the CAAQS for these pollutants.

[7] The terms ROG (reactive organic gases), VOC (volatile organic compounds), and hydrocarbons (HC) are used synonymously in this document.

Table 24-4
State Attainment Status for the Two Counties that Comprise the Primary Study Area (Glenn and Colusa)

Pollutant	Glenn County		Colusa County	
	2006 State Nonattainment Designations – CAAQS* (Source: ARB, 2007)	2011 State Nonattainment Designations – CAAQS (Source: ARB, 2012b)	2006 State Nonattainment Designations – CAAQS (Source: ARB, 2007)	2011 State Nonattainment Designations – CAAQS (Source: ARB, 2012b)
Ozone	N-T	N	N-T	N-T
$PM_{2.5}$	U	U	U	A
PM_{10}	N	N	N	N
Carbon monoxide	U	U	U	U
Nitrogen dioxide	A	A	A	A
Sulfur dioxide	A	A	A	A
Sulfates	A	A	A	A
Lead	A	A	A	A
Hydrogen sulfide	U	U	U	U
Visibility-reducing particles	U	U	U	U

*California Ambient Air Quality Standards

Notes:
A = Attainment.
N = Nonattainment.
N-T = Nonattainment-Transitional: a subcategory of the nonattainment designation category for State air quality standards that signals progress and implies the area is nearing attainment. Districts with nonattainment-transitional status may revise their attainment plans to delay adoption of control measures if they anticipate attainment without the measures.
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.
U = Unclassified.

Source: ARB, 2007 and 2012b.

The ARB compiles annual average emissions of total organic gases, ROG, CO, NO_x, sulfur oxides, particulate matter, PM_{10}, and $PM_{2.5}$ for areas throughout the State. Table 24-5 lists the estimated annual average emission inventory for stationary sources, area-wide sources, and mobile sources for each of these pollutants in 2010 for the Sacramento Valley Air Basin (SVAB), and for Glenn and Colusa counties. As shown, each of the counties' contributions to the emissions was minor, when compared to the emissions for the SVAB as a whole.

The region's topographic features restrict air movement through and out of the basin. As a result, the northern SVAB is highly susceptible to pollutant accumulation over time. In addition, transport of pollutants into the northern SVAB from the Sacramento Metropolitan Area is primarily influenced by air movement northward. These sources contribute to the region's poorest air quality, which typically occurs during the summer months.

Table 24-5
2010 Estimated Annual Average Emissions (tons per day) for the Sacramento Valley Air Basin and Glenn and Colusa Counties

Pollutant	Area		
	2010 SVAB[d]	2010 Glenn County	2010 Colusa County
Stationary Sources[a]			
Total organic gases	176.5	11.3	5.6
Reactive organic gases	32.9	2.9	2.4
Carbon monoxide	52.2	3.5	1.7
Nitrogen oxides	37.8	4.0	5.2
Sulfur oxides	1.6	0.2	0.3
Particulate matter	30.6	2.5	1.9
PM_{10}	18.0	1.4	0.8
$PM_{2.5}$	10.4	0.7	0.3
Area-Wide Sources[b]			
Total organic gases	173.5	21.0	12.4
Reactive organic gases	62.6	5.1	3.0
Carbon monoxide	293.2	31.3	11.2
Nitrogen oxides	9.3	0.1	0.7
Sulfur oxides	0.8	0.0	0.1
Particulate matter	371.2	24.4	30.9
PM_{10}	203.0	13.7	15.9
$PM_{2.5}$	55.4	4.8	3.3
Mobile Sources[c]			
Total organic gases	96.7	2.0	2.0
Reactive organic gases	88.8	1.8	1.8
Carbon monoxide	695.4	12.3	10.5
Nitrogen oxides	202.0	6.4	6.8
Sulfur oxides	1.0	0.0	0.0
Particulate matter	11.4	0.3	0.3
PM_{10}	11.1	0.3	0.3
$PM_{2.5}$	8.9	0.3	0.3

[a]Stationary sources can include fuel combustion, waste disposal, cleaning and surface coating, petroleum production and distribution, and industrial processes.

[b]Area-wide sources include solvent evaporation and miscellaneous processes.

[c]Mobile sources include on-road motor vehicles and other mobile sources.

[d]Sacramento Valley Air Basin

Notes:

$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.

Source: ARB, 2012a.

Tables 24-6 and 24-7 summarize the ambient concentrations for the nonattainment pollutants ozone and PM_{10} in the Primary Study Area over the eight-year period of 2004 to 2011. Ozone concentrations and the number of days the ozone standard(s) are exceeded each year are presented in comparison to the State 1-hour and 8-hour standards, and the federal 8-hour standards (data for both the 1997 and 2008 federal 8-hour standards are provided). PM_{10} concentrations are presented in comparison to the State and federal 24-hour standards. The reported data in these tables were taken from the Colusa-Sunrise Boulevard ARB monitoring station in Colusa County, and the Willows East Laurel Street and Willows 720 North Colusa Street ARB monitoring stations in Glenn County.

Table 24-6
Number of Days State 1-Hour and 8-Hour and Federal 8-Hour Ozone Standards Were Exceeded, and Maximum Ozone Concentrations Measured, in Glenn and Colusa Counties (2004 to 2011)

Year	% of Days Monitored[a]	Number of Days Ozone Standard Was Exceeded		Maximum Measured 1-hr and 8-hr Ozone Concentrations (ppm[e])	
		State Standards (Number of Days > 1-Hr; > 8-Hr State Standard)	Federal 8-Hr Standards (Number of Days >1997; >2008 Standards)	1-Hr High	8-Hr High
Glenn County					
2011[c]	89	0; 1	0; 0	0.082	0.072
2010[c]	100	0; 0	0; 0	0.076	0.064
2009[c]	100	0; 4	0; 0	0.085	0.075
2008[c]	99	0; 2	0; 0	0.085	0.071
2007[c]	98	0; 3	0; 2	0.091	0.078
2006[b,d]	80	0; 0	0; 0	0.076	0.066
2005[b]	100	0; 1	0; 0	0.077	0.070
2004[b]	95	0; 1	0; 0	0.084	0.070
Colusa County					
2011	99	0; 0	0; 0	0.090	0.066
2010	98	0; 1	0; 1	0.082	0.076
2009	94	0; 0	0; 0	0.078	0.068
2008	98	0; 6	0; 1	0.091	0.081
2007	97	0; 0	0; 0	0.080	0.067
2006	100	0; 2	0; 1	0.084	0.076
2005	100	0; 2	0; 0	0.085	0.074
2004	99	0; 1	0; 0	0.084	0.073

[a]Based on 1-Hour Year Coverage.

[b]Data from Willows-E Laurel Street ARB monitoring station in Glenn County.

[c]Data from Willows-720 N Colusa Street ARB monitoring station in Glenn County.

[d]Data were available for both Glenn County ARB monitoring stations. The Willows-E Laurel Street station data were assumed to be more representative because this station had a yearly coverage of 80 percent, while the Willows-720 N Colusa station only had a yearly coverage of 18 percent.

[e]Parts per million

Notes:

California 1-hour Ozone Standard = 0.09 ppm (ARB, 2012e).

California 8-hour Ozone Standard = 0.070 ppm (ARB, 2012e). Effective May 17, 2006.

Federal 8-hour Ozone Standard (1997) = 0.08 ppm; the Federal 8-hour Standard was reduced to 0.075 ppm in March 2008 (USEPA, 2008).

The national 1-hour ozone standard was revoked in June 2005 and is no longer in effect.

Source: ARB, 2012c.

Table 24-7
PM_{10} Concentrations in Glenn and Colusa Counties (2004 to 2011)

Year	% of Days Monitored	Number of Days PM_{10} Standard Was Exceeded: State 24-Hr	Number of Days PM_{10} Standard Was Exceeded: Federal 24-Hr	Maximum 24-Hr PM_{10} Concentration (µg/m3)[f]: State	Maximum 24-Hr PM_{10} Concentration (µg/m3)[f]: Federal	Annual Average PM_{10} Concentration (µg/m3): State	Annual Average PM_{10} Concentration (µg/m3): Federal[a]
Glenn County							
2011[d]	100	0	0	49.1	48.1	19.1	19.0
2010[d]	100	0	0	44.5	45.2	16.7	16.5
2009[d]	100	11.8	0	73.1	71.3	20.2	20.0
2008[d]	100	[b]	0	120.4	121.5	[b]	26.8
2007[d]	99	0	0	43	43	20	19.4
2006[c,e]	62	[b]	[b]	77	78	[b]	20.0
2005[c]	98	18.3	0	69	67	21.5	21.1
2004[c]	100	23.7	0	138	135	25.5	25.2
Colusa County							
2011	97	17.6	0	69.7	69.7	21.6	21.1
2010	100	[b]	0	49.8	49.6	[b]	17.0
2009	99	18.4	0	56.6	56.5	22.1	21.7
2008	95	62.4	0	90.3	90.3	30.5	30.4
2007	86	0	0	43	43	22	21.5
2006	75	[b]	[b]	69	68	[b]	19.3
2005	93	25.8	0	92	91	25.5	23.8
2004	91	[b]	[b]	81	81	[b]	18.5

[a]The national annual PM_{10} standard was revoked in December 2006, and is no longer in effect. The statistic shown here applies only to that standard and is included only for retrospective use.

[b]There were insufficient (or no) data available to determine the value.

[c]Data from Willows-E Laurel Street ARB monitoring station in Glenn County.

[d]Data from Willows-720 N Colusa Street ARB monitoring station in Glenn County.

[e]Data were available for both Glenn County ARB monitoring stations. The Willows-E Laurel Street station date were assumed to be more representative because this station had a yearly coverage of 62 percent, while the Willows-720 N Colusa station only had a yearly coverage of 27 percent.

[f]microgram per cubic meter

Notes:

California 24-hour PM_{10} Standard = 50 µg/m3 (ARB, 2012e).
California Annual Arithmetic Mean Standard = 20 µg/m3 (ARB, 2012e).
Federal 24-hour PM_{10} Standard = 150 µg/m3 (ARB, 2012e).

Source: ARB, 2012d.

The higher ozone concentrations, including those that exceed standards, typically occur during the months of May through October in the northern SVAB. NO_x and ROG are chemical precursors for ground-level ozone (or smog) formation. Motor vehicles, power plants, factories, chemical solvents, and various combustion sources are leading emitters of these pollutants.

Table 24-7 shows the PM_{10} concentrations from 2004 to 2011. Particulate matter can cause damage to human lungs when it enters the body through the respiratory system. The extent of the damage depends on the toxicity of the substance and the particle size. Sources of these pollutants include industries that emit airborne pollution, agricultural operations, dust resulting from high winds and soil erosion, dust from construction, vehicular travel on paved and unpaved roads, and vehicular exhaust emissions. As shown in Table 24-7, monitoring stations in both counties recorded PM_{10} levels exceeding the State standard.

In 2011, there were no days in Glenn County when the PM_{10} measurements were above the national or State 24-hour standard. In 2011, there were no days in Colusa County when the PM_{10} measurements were above the national 24-hour standard; there were 17.6 days in 2011 when air in Colusa County exceeded the State 24-hour PM_{10} standard (ARB, 2012d).

24.2.3.2 Regional Haze and Visibility Impairment

Natural and human-caused pollution in the atmosphere can degrade visibility, resulting in what is known as regional haze (ARB, 2008). Particulate pollution, including sulfates, nitrates, organics, soot, fine soil dust, and particles, contribute to the regional haze that impairs visibility, in addition to affecting public health.

24.2.3.3 Toxic Air Contaminant/Hazardous Air Pollutant Emissions

In addition to the criteria air pollutants, toxic air contaminants are another group of airborne pollutants that may be hazardous to human health, even in small quantities. Toxic air contaminants can cause or contribute to an increase in deaths or serious illness, or can pose a present or potential hazard to human health (ARB, 2011). Substances that have been identified as hazardous air pollutants pursuant to Section 112 (b) of the federal Clean Air Act are also included in the ARB list of toxic air contaminants. Toxic air contaminants can cause short-term (acute) and long-term (chronic or carcinogenic) adverse human health effects. They can be emitted from a variety of common sources, including gasoline stations, automobiles, dry cleaners, industrial operations, and painting operations. Agricultural and construction activities can also contribute to toxic air emissions. In 1998, the ARB identified particulate emissions from diesel-fueled engines (i.e., diesel PM) as a toxic air contaminant.

24.2.3.4 Existing Sensitive Receptors

A sensitive receptor is generically defined as a location where human populations (especially children, seniors, or ill persons) are found, and there is reasonable expectation of human exposure to air pollutants of concern. Examples of sensitive receptors include residences, hospitals, day-care centers, and schools. The Primary Study Area is rural, for the most part, with a few residences located near areas proposed for construction.

24.2.3.5 Odors

Odors may result from construction and operation of projects, especially if activities involve or would result in anaerobic decomposition of organic materials. Odors rarely cause physical health effects but may be unpleasant and may result in complaints from the public. Odor impacts vary in frequency and severity, depending on the nature, frequency, and intensity of the source, the wind speed and direction, and the sensitivity and location of the receptors. Projects may result in objectionable odors if located near receptors. Air districts typically regulate odor sources under nuisance regulations, and base the level of significance of odors on the number of complaints received.

24.3 Environmental Impacts/Environmental Consequences

24.3.1 Regulatory Setting

Air quality throughout California is regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations that were in effect as of June 2009. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

24.3.1.1 Federal Plans, Policies, and Regulations

- Federal Clean Air Act (FCAA)
- National Ambient Air Quality Standards and Federal Air Quality Designations
- Federal General Conformity Requirements[8]
- Prevention of Significant Deterioration/New Source Review and New Source Performance Standards
- Federal Regulations for Hazardous Air Pollutants
- Federal Standards for Mobile Sources

24.3.1.2 State Plans, Policies, and Regulations

- California Clean Air Act (CCAA)
- Mulford-Carrell Act
- California Ambient Air Quality Standards and State Air Quality Designations
- State Implementation Plans
- California Air Toxics Programs
- California Mobile Source Emission Control Programs

24.3.1.3 Regional and Local Plans, Policies, and Regulations

- Regional and Local Air Quality Management Plans
- Local Air District CEQA Guidance Documents Pertaining to Air Quality
- Glenn and Colusa County General Plans

24.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for air quality:

Would the Project:

- Conflict with or obstruct implementation of the applicable air quality plan?
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation?
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?
- Expose sensitive receptors to substantial pollutant concentrations?
- Create objectionable odors affecting a substantial number of people?

[8] Glenn and Colusa counties are designated as unclassified or attainment for all the NAAQS, so the general conformity rule does not apply to the Project or alternatives. General conformity applies to only federal actions that are in areas that are designated as nonattainment or maintenance for one or more of the NAAQS.

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Conflict with an applicable air quality plan, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of nonattainment pollutants.
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

The CEQA Guidelines for air quality in Appendix G indicate that, where available, the thresholds of significance established by the applicable air quality management or air pollution control district may be relied upon to make the significance determinations.

The Tehama County Air Pollution Control District (TCAPCD) has developed specific air quality guidelines and criteria for compliance with CEQA[9] (TCAPCD, 2009). TCAPCD has established recommended significance thresholds for Project construction and/or operation. Projects with the potential to have higher emission levels are subject to increasingly more stringent environmental review and mitigation requirements.

Projects with the potential to exceed ambient air quality standards and projects with the potential to emit toxic or hazardous air pollutants may be required to conduct dispersion modeling and/or a health risk assessment to evaluate modeled emission concentration values, or allow comparison to health-risk related thresholds. Emissions of toxic or hazardous air pollutants would be considered significant if they result in ambient concentrations and human exposures that exceed acceptable levels or contribute significantly to the area's excess lifetime cancer risk values, cancer burden, or health hazard indices.

The pollutants of greatest concern in the Primary Study Area are ozone and the ozone precursors (NO_x and ROG) primarily from vehicle and equipment exhaust, and particulate matter (PM_{10}) from soil disturbance and wind erosion (fugitive dust). Glenn and Colusa counties are designated as nonattainment for the CAAQS for these pollutants, and the significance thresholds established by the nearby local air districts are mass-based emission rates for these pollutants of concern. As a result, the discussion of environmental consequences focuses on NO_x, ROG, and PM_{10} pollutants as indicators of potential Project-related air quality impacts.

The thresholds of significance for these pollutants of concern are presented in Table 24-8. General Conformity de minimis levels are not applicable in Primary Study Area because Glenn and Colusa counties are designated as unclassified or attainment for all NAAQS, and general conformity applies only to federal actions in areas designated as nonattainment or maintenance for any of the NAAQS.

[9] The Glenn County Air Pollution Control District (GCAPCD) does not have CEQA guidelines for assessing air quality impacts; it would instead defer to the Butte County guidelines, if necessary (Ledbetter, 2009). In 2008, the Butte County AQMD published its CEQA Air Quality Handbook, *Guidelines for Assessing Air Quality Impacts for Projects Subject to CEQA Review* (Butte County AQMD, 2008). In addition, the Colusa County Air Pollution Control District (CCAPCD) does not have CEQA guidelines other than its New Source Review rules; thresholds developed by the Tehama County Air Pollution Control District (TCAPCD) would represent similar values (Gomez, 2009). The Butte County and Tehama County thresholds are the same values.

Table 24-8
Tehama County Air Pollution Control District Thresholds of Significance for Criteria Pollutants of Concern

Pollutant	Level A[a]	Level B[b]	Level C[c]
NO_x	≤ 25 lbs/day	> 25 lbs/day	> 137 lbs/day
ROG	≤ 25 lbs/day	> 25 lbs/day	> 137 lbs/day
PM_{10}	≤ 80 lbs/day	> 80 lbs/day	> 137 lbs/day
Level of Significance	Potentially Significant Impacts	Potentially Significant Impacts	Significant Impacts

[a]**Level A:** Any project that has the potential to emit the Level A thresholds would be subject to Standard Mitigation Measures (SMM). Guidelines are recommended to assist in reducing air quality impacts to a level of insignificance.

[b]**Level B: Greater than 25 pounds per day of ROG and/or NO_x and greater than 80 pounds per day of PM_{10} Emissions.** Projects that exceed Level B thresholds have the potential to cause significant air quality impacts, and should be submitted to TCAPCD for review. Projects proponents can select as many Best Available Mitigation Measures (BAMM) as needed, in addition to the recommended list of SMM. If all feasible mitigation measures are incorporated into the Project and emissions are still greater than Level B, additional mitigation measures, including off-site mitigation, may be required.

[c]**Level C: Greater than 137 pounds per day of Emissions.** If emissions from a Project would exceed the Level C thresholds, mitigation measures (BAMMs and SMMs), including off-site mitigation measures following the guidelines, may be required to reduce the overall air quality impacts of the project to a level of insignificance (TCAPCD, 2009).

Notes:

NO_x = nitrogen oxides.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair).
ROG = reactive organic gases.

Source: TCAPCD, 2009.

24.3.3 Impact Assessment Assumptions and Methodology

24.3.3.1 Assumptions

The following assumptions were made regarding Project-related impacts (construction, operation, and maintenance impacts) to air quality:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.

24.3.3.2 Methodology

Air quality impacts from implementation of the alternatives were evaluated in terms of how construction and operations of proposed Project facilities would result in criteria pollutant, toxic air contaminant, and odor emissions. The TCAPCD thresholds were used to evaluate the significance of Project-related air quality impacts because these values have been formally or informally adopted by other air districts in the area (i.e., Glenn County APCD, Butte County AQMD, and Colusa County APCD). Appendix 24A provides the methodology, assumptions, and information used to evaluate the potential air quality impacts associated with construction, and operations and maintenance, of the alternatives. In addition, Appendix 24A includes the emission calculations, emission factors, and summary tables.

Indirectly, the expected changes in operation of power production facilities at Oroville, Shasta, Trinity, and Folsom may affect Project-related emissions. The direct and indirect emissions associated with changes in water operations, power generation, and pumping in the Extended and Secondary study areas were quantified for NO_x as an indicator of criteria pollutant impacts; other pollutants and other indirect effects were evaluated on a qualitative basis.

24.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

24.3.5 Impacts Associated with the No Project/No Action Alternative

24.3.5.1 Extended and Secondary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts on air quality has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on air quality, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to cause increases in emissions of criteria pollutants. Air quality impacts that would occur as a result of the increased population would be managed in accordance with the regulations that are in effect at the time by various levels of government. Mitigation measures are outlined in local and regional air quality plans prepared by the local air districts and USEPA. Therefore, **there would not be a substantial adverse effect** associated with population growth, when compared to Existing Conditions.

If the No Project/No Action Alternative is implemented, ongoing systemwide net generation and consumption of electricity by the existing CVP and SWP facilities would occur. Energy use by SWP pumping facilities is predicted to increase in the future, resulting in a net decrease in CVP and SWP electrical generation, when compared to Existing Conditions[10]. For a further discussion of the power impacts, refer to Table 31-7 and Section 31.3.5.1 in Chapter 31 Power Production and Energy.

To evaluate the potential indirect air quality impacts of systemwide increases in electricity use and decreases in generation, NO_x emissions were estimated for the predicted systemwide net generation of electricity by CVP, SWP, and other related facilities for Existing Conditions and the No Project/No Action Alternative (Table 24-9). NO_x emissions were estimated as an indicator of potential indirect emissions impacts; the other criteria pollutant emissions associated with electricity generation were not estimated. The expected increased net energy consumption associated with the No Project/No Action Alternative would result in NO_x emissions of up to 210 pounds per day above Existing Conditions. These emission levels have been estimated to represent the maximum potential indirect effects and could potentially be lower, due to multiple sources of uncertainty and the assumptions used to estimate energy consumption. These potential electricity-related impacts would depend on how and where the electricity is generated. Increased energy efficiency and use of electricity generated by renewable energy sources would result in lower levels of emissions. The electrical generating facilities producing the power would be subject to stringent air quality permitting and emission control requirements, and the systemwide incremental increase in emissions would occur over a large geographic area. As a result, electricity-related emissions of criteria pollutants associated with implementation of the No Project/No Action Alternative **would not have a substantial adverse effect** on air quality, when compared to Existing Conditions.

[10] These impacts are attributable to increases in demands associated with water rights and CVP contracts north of the Delta and increases in demands associated with SWP contracts south of the Delta. The result of these changes in demands is increased long-term average pumping at the SWP Banks Pumping Plant and related pump stations throughout the California Aqueduct.

Table 24-9
Indirect NO_x Emissions from CVP, SWP, and Other Related Electricity Use for Existing Conditions and the No Project/No Action Alternative

Alternative	Long-Term CVP and SWP Electricity Net Use (GWh/yr)[a]	Total NO_x Emissions (lb/day)[b]	Systemwide Incremental Increase (Compared to Existing Conditions) NO_x Emissions (lb/day)
Existing Conditions	-51	(59)	Not Applicable
No Project/No Action Alternative	132	152	210

[a]Source for Project Electricity Net Use: Power and Pumping Cost Reporting Metrics-Summary, NODOS ADEIR/S and FS Alternatives, February 8, 2011, as presented in Appendix 31B. Negative values for net electricity use indicate net electricity generation, and emission values in parenthesis indicated a net emissions benefit. Other related energy use includes energy use for Glenn-Colusa Irrigation District Canal pumping facilities.

[b]Source for NO_x Emission Factor: USEPA, 2012b.

Notes:

CVP = Central Valley Project
GWh/yr = gigawatt hours per year
lb/day = pounds per day
NO_x = nitrogen oxides
SWP = State Water Project

Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to substantial pollutant concentrations.

Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to objectionable odors.

24.3.5.2 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

Refer to the **Impact Air Qual-1** discussion for the Extended and Secondary study areas. In addition, projects included in the No Project/No Action Alternative are not located within the Primary Study Area and therefore, **would not have a substantial adverse effect** on air quality in the Primary Study Area, when compared to Existing Conditions.

Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations

Refer to the **Impact Air Qual-1** discussion for the Extended and Secondary study areas. That discussion also applies to substantial pollutant concentrations.

Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People

Refer to the **Impact Air Qual-1** discussion for the Extended and Secondary study areas. That discussion also applies to objectionable odors.

24.3.6 Impacts Associated with Alternative A

24.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

No direct Project-related construction or maintenance activities would occur in the Extended Study Area, so there would be no direct Project-related emissions or impacts. It is not possible to quantify the indirect air quality emissions or impacts associated with more reliable water supplies for agriculture, municipal and industrial use, and reservoirs, or the provision of an alternate source of refuge water supply; however, these impacts would likely be beneficial because these systems would be maintained in a healthier, more productive state. Potential fugitive dust impacts due to continued fluctuating reservoir levels at San Luis Reservoir would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative, because exposure of shorelines would be intermittent, and dust emissions from exposed areas would not be substantial. Therefore, air quality impacts in the Extended Study Area would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to substantial pollutant concentrations.

Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to objectionable odors.

24.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay.

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

The only Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing concrete pump bay at the Red Bluff Pumping Plant, located on the Sacramento River. Construction would require limited operation of construction equipment, such as one mobile crane, and would not be expected to involve earthmoving or land disturbance. Air quality impacts from this minimal construction activity would be minor. Therefore, when compared to Existing

Conditions and the No Project/No Action Alternative, the construction-related air quality impacts in the Secondary Study Area would result in a **less-than-significant impact**.

Operation of the additional pump at the Red Bluff Pumping Plant, as part of Alternative A, would not significantly change the air emissions that are currently generated at the plant. The only Project-related maintenance activity that would occur in the Secondary Study area is related to the removal of sediment from the existing GCID Canal and Red Bluff Pumping Plant intakes. The additional pump at the Red Bluff Pumping Plant would not increase the frequency of existing maintenance activities at the pumping plant, and would not require additional personnel. More frequent dredging of the pumping plant forebay may be required, but this dredging and the additional pumping activities would not be expected to result in a substantial increase in air emissions when compared to existing activities. When compared to Existing Conditions and the No Project/No Action Alternative, Alternative A would result in minor increases in emissions from operations and maintenance activities in the Secondary Study Area, resulting in a **less-than-significant impact**.

When compared to Existing Conditions and the No Project/No Action Alternative, potential changes in the locations and types of recreational use due to the expected improved reservoir storage conditions with implementation of Alternative A may result in changes in emissions, but systemwide recreation-related emissions and impacts would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

The expected improved reservoir storage conditions would leave less exposed barren land at the reservoir's edges. Therefore, incremental, intermittent dust emissions and related impacts from exposed areas would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Air quality impacts associated with systemwide increases in electrical use and decreases in net electrical generation would depend on how and where the replacement electricity is generated[11]. For a further discussion of the power impacts, refer to Table 31-8 and Section 31.3.6.1 in Chapter 31 Power Production and Energy. The electrical generating facilities producing the power would be subject to stringent air quality permitting and emission control requirements, and the systemwide incremental increase in emissions would occur over a large geographic area. As a result, electricity-related emissions of criteria pollutants would result in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to substantial pollutant concentrations.

Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People

Refer to the **Impact Air Qual-1** discussion. That discussion also applies to objectionable odors.

[11] As a result of the increased storage of Sites Reservoir, CVP and SWP water supply deliveries and exports from the Delta would be increased. There would be increased long-term average pumping at the SWP Banks Pumping Plant and related pump stations throughout the California Aqueduct. There would also be increased generation at system reservoirs and at Sites Reservoir, but the increase in pumping would be larger than the increase in generation, and therefore, the net generation would decrease for the action alternatives.

24.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Construction and operation of proposed Project facilities would result in criteria pollutant emissions. Emissions of NO_x, PM_{10}, $PM_{2.5}$, ROG, CO, SO_x, and CO_2[12] would result from combustion of fuels in construction equipment and material transport trucks. Construction of facilities would result in emissions of PM_{10} and $PM_{2.5}$ from fugitive dust, generated primarily during earthmoving activities. Other sources of fugitive dust include vehicle travel on paved and unpaved roads, creation and management of quarries and borrow sites, concrete batch plants, and material handling, storage, and transport. Similar emissions, at lower levels, may result from operations and maintenance of proposed Project facilities.

All Primary Study Area Project Facilities

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an ***Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants***

Alternative A would involve the construction of proposed surface water storage reservoirs, water intakes, conveyance facilities (canals, pipelines, tunnels, and pumping plants), service roads, dams, buildings, recreation facilities, transmission lines, and hydroelectric generation facilities in the Primary Study Area.

Fuel combustion in construction equipment, trucks, and construction worker vehicles would generate criteria air pollutant emissions as exhaust. Emissions of the ozone precursors, ROG and NO_x, from these emissions sources would temporarily contribute to regional atmospheric ozone problems during the proposed construction period. Construction activities would also generate fugitive dust from sources such as unpaved roads, concrete batch plants, grading, and excavation. Fugitive dust emissions refer to emissions of PM_{10} and $PM_{2.5}$. Stationary sources that would be needed to support construction activities, such as rock quarries, asphalt plants, and concrete batch plants, would be subject to local air district permitting programs. These permitting programs would keep emissions from permitted equipment within acceptable limits.

Table 24-10 presents the estimated construction emissions for Alternative A, providing average daily construction emissions by construction year, with comparison to significance thresholds established by TCAPCD (TCAPCD, 2009). Detailed calculation spreadsheets and supporting documentation are provided in Appendix 24A.

Alternative A would involve construction, operations, and maintenance of a 1.27-MAF reservoir, Sites and Golden Gate dams, and seven saddle dams. Construction equipment utilization was assumed to be directly related to volume of materials used for dam construction (Barnes pers. comm., 2011), and fugitive dust emissions would be directly related to the area of disturbance.

When compared to Existing Conditions, estimated construction-related emissions for Alternative A would be **significant**, because they would exceed thresholds of significance for NO_x, PM_{10}, and ROG established by TCAPCD (TCAPCD, 2009).

[12] A discussion of greenhouse gases, such as CO_2, and related CEQA significance criteria and impacts, is presented in Chapter 25 Climate Change and Greenhouse Gas Emissions.

Table 24-10
Estimated Average Daily Emission Rates for Criteria Pollutants by Year for Construction of Alternative A Within the Primary Study Area

Construction Year	Emissions (lbs/day)[a,d]					
	NO_x	PM_{10}	$PM_{2.5}$	ROG	CO	SO_x
2013	**2,171**[b]	**344**	124	**247**	833	3
2014	**4,114**	**750**	247	**467**	1,604	5
2015	**3,639**	**655**	219	**414**	1,420	4
2016	**3,688**	**661**	222	**420**	1,448	4
2017	**1,913**	**419**	125	**216**	775	2
2018	**617**	**209**	55	68	267	1
2019	**617**	**209**	55	68	267	1
2020	**519**	**188**	48	57	215	1
2021	98	21	8	11	52	0
Significance Threshold (lb/day)[c]	137	137	-	137	-	-

[a]The average daily construction emission rates for each criteria pollutant (in lb/day) for each construction year are the sum of the average daily emission rates estimated for each of the proposed Project features that would be constructed in the indicated construction year.

[b]**Bolded** values indicate an exceedance of the Significance Threshold.

[c]Significance Threshold is from TCAPCD Level C: Greater than 137 pounds per day of emissions. If emissions from a project would exceed the Level C thresholds, all feasible mitigation measures, including Suggested Mitigation Measures (SMMs), Best Available Mitigation Measures (BAMMs), and off-site mitigation measures, may be required to reduce the overall air quality impacts of the project to a level of insignificance (TCAPCD, 2009).

[d]Fugitive dust emissions from grading were assumed to include daily watering of disturbed areas to control dust, and vehicles traveling on unpaved roads were assumed to be limited to 15 miles per hour.

Notes:

CO = carbon monoxide.
lb/day = pounds per day.
NO_x = nitrogen oxides.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
ROG = reactive organic gases.
SO_x = sulfur oxides.

Construction of the Alternative A proposed facilities would result in higher levels of emissions than implementation of the No Project/No Action Alternative in the Primary Study Area. Implementation of Alternative A would result in temporary construction-related increases in pollutant emissions, resulting in a **significant impact** on air quality in the Primary Study Area, when compared to the No Project/No Action Alternative.

Operation and maintenance of Alternative A would include activities that must occur to operate and maintain each proposed facility. These activities and their associated impacts would be long-term and permanent. Operation activities would include those related to the use of roads during operations and maintenance activities, recreation activities, the movement of water (such as Sites Reservoir level fluctuations, or the intake or release of water through the Delevan Pipeline Intake Facilities), and the generation and transmission of electricity.

Emissions associated with operations and maintenance of the Alternative A proposed facilities would depend on the size and type of facility, the number of employees and types of equipment, the increased traffic on the local and regional roadway network (including additional haul trucks and workers), and the level of operations activities. Emissions similar to those expected during construction, but at lower levels, would likely result from facility operations and maintenance. For example, operational sources of fugitive dust would primarily be maintenance equipment and truck movement over paved and unpaved surfaces. Stationary sources, such as electrical generators, would be subject to permitting requirements to limit emissions. Required mitigation and operating conditions would be reflected in needed permits and approvals for the proposed Project.

Table 24-11 presents the estimated daily emissions for operations and maintenance of the Alternative A proposed facilities, with comparison to significance thresholds established by TCAPCD (TCAPCD, 2009). Detailed calculation spreadsheets and supporting documentation are provided in Appendix 24A.

Table 24-11
Estimated Total Emission Rates in lb/day for Operations and Maintenance of Alternative A Proposed Facilities Within the Primary Study Area

	NO_x	PM_{10}	$PM_{2.5}$	ROG	CO	SO_x
Total Average Daily Emissions (lb/day)	33	7	7	38	1308	0.1
TCAPCD Threshold (lb/day), Level A	< 25	< 25	-	< 25	-	-
Threshold Exceeded?	Yes	No	-	Yes	-	-
TCAPCD Threshold (lb/day), Level B	> 25	> 25	-	> 25	-	-
Threshold Exceeded?	Yes	No	-	Yes	-	-
TCAPCD Threshold (lb/day), Level C	> 137	> 137	-	> 137	-	-
Threshold Exceeded?	No	No	-	No	-	-

Notes:

It was assumed that sedans/pickups would travel at a speed of 15 mph which equates to 3 roundtrips per hour at a distance of 5 miles per roundtrip.

An estimated total of 60 employees would support operations and maintenance work at all facilities.

CO = carbon monoxide.
lb/day = pounds per day.
NO_x = nitrogen oxides.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
ROG = reactive organic gases.
SO_x = sulfur oxides.
TCAPCD = Tehama County Air Pollution Control District

Implementation of Alternative A would provide increased opportunities for recreational uses in the Primary Study Area. The expected increase in recreational opportunities and recreation visitor days would generate additional vehicle trips to and from the area. These vehicle trips would add to the significant emissions and impacts estimated for operations and maintenance of Alternative A facilities.

Operations of the proposed Sites Reservoir, Holthouse Reservoir, and the TRR could result in significant fluctuations of water levels, leaving exposed barren land at the reservoirs' edges when the water level is lowered. Exposed areas may be sources of fugitive dust, depending on local conditions of temperature, humidity, and wind. Because these dust emissions would be intermittent, they are expected to result in a **less-than-significant impact** on air quality.

Operations of proposed Project facilities would generate electricity, but would also result in additional electricity consumption due to pumping and facility operations. Alternative A would have greater operations-related emissions than Existing Conditions and the No Project/No Action Alternative, because it would result in net energy consumption, and would require additional electricity generation. To evaluate the potential indirect impacts on air quality, NO_x emissions were estimated for the predicted systemwide net generation and consumption of electricity by CVP, SWP, and proposed Project facilities associated with Alternative A. NO_x emissions were estimated as an indicator of potential indirect emissions impacts; the other criteria pollutant emissions associated with electricity generation were not estimated.

Table 24-12 summarizes the NO_x emissions estimated for each of the action alternatives, when compared to emissions estimated for the net generation and consumption of electricity for Existing Conditions and the No Project/No Action Alternative. Emissions associated with Alternatives B and C are presented in Table 24-12 for the purpose of comparison and are evaluated in their respective discussions. Increased energy consumption associated with Alternative A would result in indirect NO_x emissions of up to 632 pounds per day above Existing Conditions, and up to 422 pounds per day above the No Project/No Action Alternative. These emission levels have been estimated to represent the maximum potential indirect effects, and could potentially be lower, due to multiple sources of uncertainty and the assumptions used to estimate electricity generation. These potential electricity-related impacts may add to emissions and significant air quality impacts in the Primary Study Area, depending on how and where the electricity is generated.

Table 24-12
Indirect NO_X Emissions from Electricity Use for Existing Conditions, the No Project/No Action Alternative, and Alternatives A, B, and C

Scenario	Electricity Long-Term Net Use (GWh/yr)[a]	Total NO_x Emissions (lb/day)[b]	Incremental Increase (Compared to Existing Conditions) NO_x Emissions (lb/day)	Incremental Increase (Compared to No Project/No Action Alternative) NO_x Emissions (lb/day)
Existing Conditions	-51	(59)	Not Applicable	Not Applicable
No Project/No Action Alternative	132	152	210	Not Applicable
Alternative A	499	573	632	422
Alternative B	498	572	631	420
Alternative C	543	624	682	472

[a]Source for Project Electricity Net Use: Power and Pumping Cost Reporting Metrics-Summary, NODOS ADEIR/S and FS Alternatives, February 8, 2011, as presented in Appendix 31B. All values include electricity use associated with CVP and SWP operations. Existing Conditions and No Project/No Action Alternative values include other related energy use for Glenn-Colusa Irrigation District Canal pumping facilities. Alternative A, B, and C values include electricity use associated with operation of the proposed Project facilities.

[b]Source for NO_x Emission Factor: USEPA, 2012b.

Notes:

Negative values for net electricity use indicate net electricity generation, and emission values in parentheses indicate a net emissions benefit.

NO_x = nitrogen oxides
CVP = Central Valley Project
SWP = State Water Project
GWh/yr = gigawatt hours per year
lb/day = pounds per day

When compared to Existing Conditions in the Primary Study Area, emissions and air quality impacts associated with long-term operations and maintenance of Alternative A would result in a **significant impact**. This finding is based on the CEQA guidance, thresholds of significance, and attainment plans for the TCAPCD (TCAPCD, 2009). Additional exceedances of significance thresholds could occur when other operational or maintenance activities occur, e.g., the proposed Holthouse Reservoir would be dredged to remove sediment periodically during the proposed Project duration, resulting in an additional 705 pounds per day of NO_x for 167 days, during dredging years, and periodic dredging would also occur at the proposed TRR and Delevan Pipeline Intake Facilities, and at the existing T-C Canal and GCID Canal intakes.

When compared to the No Project/No Action Alternative, operations and maintenance of Alternative A would result in higher levels of emissions, and a **significant impact**. For example, increased electricity consumption associated with Alternative A implementation would result in NO_x emissions of up to 422 pounds per day more than the No Project/No Action Alternative, on a systemwide basis. These potential electricity-related emissions would potentially add to emissions and significant air quality impacts in the Primary Study Area, depending on how and where the electricity is generated.

Impact Air Qual-2: Expose Sensitive Receptors to Substantial Pollutant Concentrations

Construction-related activities for large surface water reservoirs and related facilities would require the use of heavy equipment, such as excavators, graders, scrapers, bulldozers, backhoes, and concrete mixing and pumping trucks. Haul trucks would be used to move borrow and/or spoils and other materials. Emissions of CO and toxic air contaminants (TACs) could result from fuel combustion to support site preparation and construction activities required for the proposed Project. TACs that could be generated by the combustion of fuels include benzene, formaldehyde, acrolein, and other products of incomplete combustion. Health impacts from human exposure to localized CO emissions and TACs from construction are dependent on the magnitude of the concentrations that sensitive receptors may be exposed to, the duration of exposure, and the relative toxicities of the individual pollutants.

Due to the rural nature of most of the proposed Project construction activities, CO hot spots are not expected to result from construction-related changes in traffic patterns.

Emissions of airborne naturally occurring asbestos are not expected to result from proposed land disturbance activities. Ultramafic rocks likely to contain naturally occurring asbestos are not found within the Primary Study Area or in the watersheds draining into the Primary Study Area (see Chapter 16 Geology, Minerals, Soils, and Paleontology for more details).

Preparation of the proposed Sites Reservoir Inundation Area for filling would involve demolition of several structures. To avoid adverse Project-related air quality impacts, construction contractors conducting demolition and disposal of asbestos-containing material (ACM) must comply with various regulatory requirements, such as the Asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) (40 CFR 61, Subpart M).

Diesel PM from diesel-fueled on-road haul trucks and off-road equipment would be the primary TAC of concern for proposed Project construction activities. Because of the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment is typically within an influential distance that would result in the exposure of sensitive receptors to substantial concentrations. In its CEQA Guidelines, the Bay Area Air Quality Management District (BAAQMD) cites studies by ARB that show concentrations of mobile-source diesel PM are typically reduced by 70 percent at a distance of approximately 500 feet from the source. In addition, current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of nine, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of project construction activities. This results in difficulties with producing accurate estimates of health risk during construction (BAAQMD, 2011).

Most of the proposed construction activities and exhaust emissions from equipment would occur in rural areas, typically more than 1,000 feet from sensitive receptors. Diesel-fueled construction equipment would operate only a limited period of time at any given location, and would be subject to stringent regulatory requirements. When compared to Existing Conditions and the No Project/No Action Alternative, sensitive receptors would not be exposed to substantial pollutant concentrations from Project-related construction equipment exhaust emissions, and the associated impacts would be **less than significant**.

Emission sources similar to those expected during proposed Project construction, but at lower levels, would likely result from operations and maintenance of the proposed Project. Activities associated with operations and maintenance of proposed Project facilities would occur intermittently and generate emissions sporadically over the lifetime of the proposed Project. In addition, particulate matter emissions are anticipated to occur away from sensitive receptors and at levels below the TCAPCD thresholds of significance (Table 24-11). It is assumed that CO and TAC emissions from stationary sources would be subject to air district permitting requirements to limit exposure to sensitive receptors. In addition, mobile sources would be subject to ARB emission standards and Airborne Toxic Control Measures. Therefore, when compared to Existing Conditions, sensitive receptors would not be exposed to substantial pollutant concentrations and the impact would be **less than significant**.

Implementation of Alternative A would result in greater construction- and operations and maintenance-related emissions than the No Project/No Action Alternative in the Primary Study Area. However, these emissions would not be expected to expose sensitive receptors to substantial pollutant concentrations, resulting in **a less-than-significant impact**.

Impact Air Qual-3: Create Objectionable Odors Affecting a Substantial Number of People

Odors may result from construction and operation of the proposed Project, especially if activities involve or would result in anaerobic decomposition of organic materials. Alternative A operations would result in large fluctuations in water surface elevations at the proposed Sites Reservoir. Under very low reservoir elevations, algal growth may contribute to localized odors. The reservoir would be located in a rural area with no permanent residents living near the water's edge. In addition, when the reservoir would be drawn down to a very low level, it is unlikely that many recreationists would visit it, so any odors that would be generated by algal growth would be unlikely to affect a substantial number of people.

Odors may be generated through exhaust emissions from diesel equipment, but the emission sources would not remain in one location for long periods of time, and the emissions would be intermittent and would dissipate from the source rapidly. In addition, the types of land uses that typically result in odor problems include agriculture, wastewater treatment plants, food processing and rendering plants, chemical plants, landfills, composting facilities, and dairies. Alternative A does not include construction or operation of any of these land use activities or any similar land uses.

When compared to Existing Conditions, construction and operation of Alternative A would not generate objectionable odors affecting a substantial number of people and the impact would be **less than significant**.

When compared to the No Project/No Action Alternative, Alternative A would have greater construction-, operations-, and maintenance-related impacts. However, construction, operations, and maintenance activities for Alternative A are not anticipated to create objectionable odors affecting a substantial number of people because of the lack of permanent residents around the reservoir's edge, and because it is unlikely that many recreationists would visit the reservoir when it is drawn down to a very low level. This would, therefore, result in a **less-than-significant impact**.

24.3.7 Impacts Associated with Alternative B

24.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to compliance with air quality standards (**Impact Air Qual-1**), substantial pollutant concentrations (**Impact Air Qual-2**), and objectionable odors (**Impact Air Qual-3**), would be the same as those described for Alternative A for the Extended and Secondary study areas.

24.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following proposed Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to air quality:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

Alternative B includes the construction of a proposed 1.81-MAF Sites Reservoir. The increased reservoir size would require a larger footprint for the proposed Sites and Golden Gate dams and necessitate the construction of nine saddle dams. However, similar to that described for Alternative A, there are no sensitive receptors located within one mile of these facilities.

The proposed Alternative B Delevan Transmission Line would differ from Alternative A. There would be no transmission line alignment between the Sacramento River and the PG&E or WAPA transmission line. The transmission line would be approximately three miles long, from the proposed Sites Electrical Switchyard to the PG&E or WAPA transmission line, which would be located west of the proposed TRR.

Similar to that described for Alternative A, there are no sensitive receptors located within 0.5 mile of this construction area.

The proposed Alternative B Road Relocations and South Bridge would differ slightly from those described for Alternative A. The lengths of the saddle dam access roads included in Alternative A would be reduced in Alternative B because the dams would be larger and would be located closer to the main roads. In addition, an extension of an access road would be constructed for Alternative B to provide access from Saddle Dam 3 to Saddle Dams 1 and 2. However, there are no sensitive receptors located within a 0.5-mile radius of these portions of the road relocations.

Alternative B would replace the proposed Delevan Pipeline Intake Facilities with the smaller proposed Delevan Pipeline Discharge Facility. The proposed Delevan Pipeline would be operated as a release-only pipeline, so the associated Delevan Pipeline Discharge Facility would not include a fish screen or any of the facilities needed for the pumping and generating operations that were described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

These changes in facility design would result in similar construction-, operation-, and maintenance-related impacts to sensitive receptors from substantial pollutant concentrations **(Impact Air Qual-2)** and objectionable odors **(Impact Air Qual-3)** as described for Alternative A. However, emissions associated with Alternative B would be more than those estimated for Alternative A, due to the proposed Project design features included in Alternative B that would differ from Alternative A (refer to above discussion). The increased emissions are presented and discussed below.

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

Table 24-13 presents the results for emission calculations for construction of Alternative B, providing average daily construction emissions by construction year, with comparison to significance thresholds established by TCAPCD (TCAPCD, 2009). Detailed calculation spreadsheets and supporting documentation are provided in Appendix 24A. As indicated in Table 24-13, emissions estimated for construction of Alternatives B and C would be the same because there are only minor differences between the two alternatives with regard to overall construction requirements. For example, Alternative B does not include construction of the proposed Delevan Transmission Line from the PG&E or WAPA line to the Sacramento River, and the proposed Alternative C Delevan Pipeline Intake Facilities would be replaced by the smaller proposed Alternative B Delevan Pipeline Discharge Facility. These differences in required construction activities are not expected to result in substantial differences in the estimated construction emissions.

When compared to Existing Conditions in the Primary Study Area, impacts associated with temporary construction-related emissions of criteria air pollutants and precursors for Alternative B would be **significant**. Construction of Alternative B facilities would result in higher levels of emissions than for the No Project/No Action Alternative. These impacts would be temporary and adverse, resulting in a **significant impact**.

When compared to Existing Conditions in the Primary Study Area, emissions and air quality impacts associated with long-term operation and maintenance of Alternative B would result in a **significant impact**. Refer to Tables 24-11 and 24-12, and the discussion for **Impact Air Qual-1** for Alternative A in the Primary Study Area.

When compared to the No Project/No Action Alternative, Alternative B would have increased emissions. Increased electricity consumption associated with Alternative B would result in NO_x emissions of up to 420 pounds per day more than the No Project/No Action Alternative, on a systemwide basis. These electricity-related emissions would potentially add to emissions and significant impacts in the Primary Study Area, depending on how and where the electricity is generated.

Table 24-13
Estimated Average Daily Emission Rates for Criteria Pollutants by Year for Construction of Alternatives B and C

Construction Year	Emissions (lbs/day)[a,d]					
	NO_x	PM_{10}	$PM_{2.5}$	ROG	CO	SO_x
2013	**2,171**[b]	**344**	124	**247**	833	3
2014	**4,487**	**860**	274	**508**	1,749	6
2015	**4,012**	**765**	246	**455**	1,565	5
2016	**4,061**	**770**	250	**460**	1,593	5
2017	**2,286**	**528**	153	**257**	920	3
2018	**990**	**319**	83	109	412	1
2019	**990**	**319**	83	109	412	1
2020	**892**	**298**	76	98	360	1
2021	98	21	8	11	52	0
Significance Threshold (lb/day)[c]	137	137	-	137	-	-

[a]The average daily construction emission rates for each criteria pollutant (in lb/day) for each construction year are the sum of the average daily emission rates estimated for each of the Project features that would be constructed in the indicated construction year.

[b]**Bolded** values indicate an exceedance of the Significance Threshold.

[c]Significance Threshold is from TCAPCD Level C: Greater than 137 pounds per day of emissions. If emissions from a project would exceed the Level C thresholds, all feasible mitigation measures, including Suggested Mitigation Measures (SMMs), Best Available Mitigation Measures (BAMMs), and off-site mitigation measures, may be required to reduce the overall air quality impacts of the project to a level of insignificance (TCAPCD, 2009).

[d]Fugitive dust emissions from grading were assumed to include daily watering of disturbed areas to control dust, and vehicles traveling on unpaved roads were assumed to be limited to 15 miles per hour.

Notes:

CO = carbon monoxide.
lb/day = pounds per day.
NO_x = nitrogen oxides.
PM_{10} = Particulate matter consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs, where they may be deposited and result in adverse health effects. PM_{10} emissions also cause visibility reduction.
$PM_{2.5}$ = Includes particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.
ROG = reactive organic gases.
SO_x = sulfur oxides.
TCAPCD = Tehama County Air Pollution Control District.

Additional exceedances of significance thresholds and significant impacts could occur when other operational and/or maintenance activities occur, e.g., the proposed Holthouse Reservoir would be dredged to remove sediment at least once during the proposed Project duration, resulting in an additional 705 pounds per day of NO_x for 167 days during dredging years, and periodic dredging would also occur at the proposed TRR and Delevan Pipeline Intake and the existing T-C Canal and GCID Canal intakes.

24.3.8 Impacts Associated with Alternative C

24.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to compliance with air quality standards (**Impact Air Qual-1**), substantial pollutant concentrations (**Impact Air Qual-2**), and objectionable odors (**Impact Air Qual-3**), would be the same as those described for Alternative A for the Extended and Secondary study areas.

24.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following proposed Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to air quality:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the proposed Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to air quality as described for Alternative A.

The Alternative C design of the proposed Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to transportation air quality as described for Alternative B.

The boundary of the proposed Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the proposed Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

Alternative C would, therefore, result in similar construction-, operation-, and maintenance-related impacts to sensitive receptors from substantial pollutant concentrations **(Impact Air Qual-2)** and objectionable odors **(Impact Air Qual-3)** as described for Alternative A. However, emissions associated with Alternative C would differ from those estimated for Alternative A. The differences in emissions are discussed below.

Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants

Alternative C would result in a **significant impact** to air quality in the Primary Study Area from proposed Project construction, similar to that described for Alternative A. Refer to **Impact Air Qual-1** for Alternative A in the Primary Study Area. Construction emissions associated with Alternative C would be more than those estimated for Alternative A, due to the proposed Project design features included in Alternative C that would be different than Alternative A (refer to above discussion).

As presented in Table 24-13, emissions estimated for construction of Alternatives B and C would be the same, because there are only minor differences between the two alternatives with regard to construction requirements. For example, Alternative C includes construction of a transmission line from the PG&E or WAPA line to the Sacramento River and a pumping plant at the proposed Delevan Pipeline Intake Facilities, but these activities are not expected to result in substantial differences in construction emissions. Therefore, when compared to Existing Conditions, impacts associated with temporary construction-related emissions of criteria air pollutants or precursors for Alternative C in the Primary Study Area would be the same as those described for Alternative B.

Construction of Alternative C facilities would result in higher levels of emissions than for the No Project/No Action Alternative. These impacts would be the same as those described for Alternative B.

When compared to Existing Conditions in the Primary Study Area, impacts associated with long-term operation and maintenance-related emissions of criteria air pollutants and precursors associated with Alternative C would be similar to the **significant impact** described for Alternative A. Refer to Tables 24-11 and 24-12, and the discussion for **Impact Air Qual-1** for Alternative A in the Primary Study Area.

When compared to the No Project/No Action Alternative, Alternative C would result in increased emissions and significant air quality impacts. Increased electricity consumption associated with Alternative C would result in NO_x emissions of up to 472 pounds per day more than the No Project/No Action Alternative, on a systemwide basis. These electricity-related emissions would potentially add to emissions and significant impacts in the Primary Study Area, depending on how and where the electricity is generated.

24.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 24-14 for the impacts that have been identified as significant or potentially significant.

Table 24-14
Summary of Mitigation Measures for Potential NODOS Project Impacts to Air Quality

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS[a] After Mitigation
Impact Air Qual-1: Conflict with an Applicable Air Quality Plan, Contribute Substantially to an Air Quality Violation, and/or Result in a Cumulatively Considerable Net Increase of Nonattainment Pollutants	All Primary Study Area Project Facilities (construction)	Significant	Mitigation Measure Air Qual-1a: Develop a Fugitive Dust Control Plan	Significant and Unavoidable for Emissions of PM_{10}
			Mitigation Measure Air Qual-1b: Implement Measures to Reduce Equipment and Vehicle Exhaust Emissions	Significant and Unavoidable for Emissions of NO_x, PM_{10}, and ROG
				Less than Significant for Emissions of SO_x, CO, and $PM_{2.5}$
	All Primary Study Area Project Facilities (operation and maintenance)[b]	Significant	Mitigation Measure Air Qual-1a: Develop a Fugitive Dust Control Plan	Less than Significant
			Mitigation Measure Air Qual-1b: Implement Measures to Reduce Equipment and Vehicle Exhaust Emissions	Less than Significant

[a]LOS = Level of Significance

[b]Approaches and mitigation measures to address the electricity-related emissions associated with State Water Project and Central Valley Project operational changes are discussed in Chapter 25 Climate Change and Greenhouse Gas Emissions.

Mitigation Measure Air Qual-1a: Develop a Fugitive Dust Control Plan

The Fugitive Dust Control Plan shall include the following information and measures to reduce fugitive PM_{10} and $PM_{2.5}$ emissions:

- Name(s), address(es), and phone number(s) of person(s) responsible for the preparation, submission, and implementation of the plan.
- Description and location of construction activities.
- Listing of all fugitive dust emissions sources.

Land Clearing/Earth Moving:

- Water shall be applied by means of truck(s), hoses, and/or sprinklers as needed prior to any land clearing or earth movement to minimize dust emission.
- Haul vehicles transporting soil into or out of the property shall be covered.
- Water shall be applied to disturbed areas a minimum of two times per day or more as necessary.

- A publicly visible sign shall be posted with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 24 hours. The telephone number of the local air district shall also be included and visible on the sign.
- All excavation, grading, and/or earth moving activities shall be suspended when average wind speeds exceed 25 mph.

Visibly Dry Disturbed Soil Surface Areas:

- All visibly dry disturbed soil surface areas of operation shall be treated with a dust palliative agent and/or watered to minimize dust emission.

Paved Road Track-Out:

- Existing roads and streets adjacent to the Project shall be cleaned at least once per day unless conditions warrant a greater frequency.

Visibly Dry Disturbed Unpaved Roads:

- All visibly dry disturbed unpaved road surface areas of operation shall be watered to minimize dust emission.
- Unpaved roads shall be graveled to reduce dust emissions, to the extent feasible.
- Water shall be applied to disturbed areas a minimum of two times per day or more as necessary.
- On-site vehicles shall be limited to a speed of 15 miles per hour on unpaved roads.
- Haul roads shall be sprayed down at the end of the work shift to form a thin crust. This application of water shall be in addition to the minimum rate of application.

Vehicles Entering/Exiting Construction Area:

- Vehicles entering or exiting the construction area shall travel at a speed which minimizes dust emissions.

Employee Vehicles:

- Construction workers shall park in designated parking areas(s) to help reduce dust emissions.

Soil Piles:

- Soil pile surfaces shall be moistened if dust is being emitted from the pile(s). Adequately secured tarps, plastic, or other material may be required to further reduce dust emissions. This includes materials stored in piles for use in the concrete batch plant.

Mitigation Measure Air Qual-1b: Implement Measures to Reduce Equipment and Vehicle Exhaust Emissions

- All construction equipment shall be maintained according to manufacturer's specifications.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]).

- During all construction activities, diesel-fueled portable equipment with maximum power greater than 25 horsepower shall be registered under the ARB's Statewide Portable Equipment Registration Program.
- All fleets of diesel-fueled off-road vehicles shall comply with the emissions standards pursuant to CCR Title 13, Section 2449. To the extent feasible, operate off-road vehicles with engines certified to the Tier 2 or newer emissions standards.
- All on-road trucks shall be operated in compliance with the emission standards per CCR Title 13, Section 2025. To the extent feasible, operate on-road trucks with engines certified to the 2007 model year or newer heavy-duty diesel engine emissions standards.
- To the extent feasible, electric equipment shall be operated.
- Alternatively fueled construction equipment shall be used, to the extent feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.
- Electricity used to power facilities and equipment shall be generated by renewable energy sources with state-of-the-art emissions control systems, to the extent feasible.

Implementation of **Mitigation Measures Air Qual-1a** and **Air Qual-1b** would reduce the level of significance of potential proposed Project impacts to air quality to **less-than-significant** for emissions of SO_x, CO, and $PM_{2.5}$ during Project construction and for all emissions during operation and maintenance.

Implementation of **Mitigation Measures Air Qual-1a** and **Air Qual-1b** would lessen the effects of proposed Project-related NO_x, PM_{10}, and ROG emissions on air quality, but impacts would remain **significant and unavoidable** for emissions of NO_x, PM_{10}, and ROG during Project construction.

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Figure

California Air Basins and Counties

California Air Districts and Counties

Source: California Air Resources Board, 2010.

WBG020812033556SAC

FIGURE 24-1
Project Location Relative to Air Basins and Air Districts
North-of-the Delta Offstream Storage Project

25. Climate Change and Greenhouse Gas Emissions

25.1 Introduction

This chapter includes (1) an environmental setting/affected environment for greenhouse gases and climate change, (2) a GHG impact analysis of the potential environmental effects of GHGs emitted by construction, operation, and maintenance of the proposed Project, and (3) a climate change sensitivity analysis of the projected changes in future climate and its expected effects on the proposed Project, as well as the environmental effects on climate from the proposed Project.

The GHG impact analysis and climate change sensitivity analysis presented in this chapter provide two related analyses of the proposed Project. The greenhouse gas emissions portion of this chapter is presented first, and focuses on the effect of the proposed Project's alternatives on climate change, including an evaluation of greenhouse gases produced as a result of implementation of the proposed Project alternatives. The impact analysis provides the analysis required by CEQA (*CEQA Guidelines* §15064.4) to determine whether the proposed Project would have an adverse impact on the environment by emitting GHGs that could contribute to further global climate change.

The regulatory setting for GHG emissions and climate change is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

The existing and potential changes in water operations, power generation, and pumping in the Extended and Secondary study areas as a result of construction, operation, and maintenance of the proposed Project were evaluated, and the associated changes in GHG emissions were estimated. GHG emissions are not directly linked to specific impacts at geographic locations; instead, emissions from individual sources around the globe, including those potential sources of emissions described as part of the proposed Project, result in contributions to global GHG concentrations in the atmosphere, which may result in impacts that manifest themselves at global, regional, and local scales. As a result, this chapter is not separated into analyses of the Extended, Secondary, and Primary study areas. Instead, GHG emissions were analyzed for the proposed Project in terms of short-term construction emissions and long-term operational and maintenance emissions. GHG emissions from implementation of the proposed Project were analyzed as a cumulative environmental impact; therefore, GHG emissions from the proposed Project have been placed in the context of the statewide, national, and global GHG emissions and global atmospheric concentrations of GHGs.

GHG emissions from the proposed Project are not tied directly to potential impacts of climate change. Instead, GHG emissions from the proposed Project and potential impacts of climate change on the proposed Project are handled separately.

The climate change sensitivity analysis provides an analysis of how projected future climate change could impact the performance and environmental impacts of the proposed Project with a focus on water resources and related systems. The climate change sensitivity analysis provides a discussion of the potential effects of climate change on the proposed Project alternatives, including the No Project/No Action Alternative and Alternatives A, B, and C.

25.2 Background

Climate is the average of conditions (based on averages of 20 to 30 years) of temperature, seasonality, precipitation, humidity, and types and frequency of extreme events, such as tornadoes or heat waves. For example, the climate of California's Central Valley is a Mediterranean climate, which is hot and dry during the summer and cool and damp in winter, with the majority of precipitation falling as rain in the winter months and tornadoes rarely occurring. Climate is unique to a particular location and changes on timescales of decades to centuries or millennia.

Climate change is a term used to describe large-scale shifts in existing (i.e., historically observed) patterns in Earth's climate system. Although the climate can and has changed in the past in response to natural drivers, recent climate change has been unequivocally linked to increasing concentrations of greenhouse gases (GHGs) in Earth's lower atmosphere and the rapid timescale on which these gases have accumulated (IPCC, 2007a). The major causes of this rapid loading of GHGs into the atmosphere include the burning of fossil fuels since the industrial revolution, agricultural practices, increases in livestock grazing, and deforestation.

The phenomenon known as the *greenhouse effect* keeps the atmosphere near the Earth's surface warm enough for the successful habitation of humans and other life forms. GHGs present in the Earth's lower atmosphere play a critical role in maintaining the Earth's temperature; GHGs trap some of the long-wave infrared radiation emitted from the Earth's surface that would otherwise escape to space (Figure 25-1). The Kyoto Protocol, which was adopted in December 1997, addresses the following six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorinated carbons (PFCs), sulfur hexafluoride (SF_6), and hydrofluorocarbons (HFCs). CEQA Guidelines §15364.5 also identifies these six gases as GHGs.

Higher concentrations of heat-trapping GHGs in the atmosphere result in increasing global surface temperatures, a phenomenon commonly referred to as *global warming*. Higher global surface temperatures, in turn, result in changes to Earth's climate system, including, but not limited to: the jet stream; El Niño; the Indian monsoon; ocean temperature and acidity; the extent of alpine glaciers, sea ice and polar ice sheets; the extent of deserts; atmospheric water content; and the extent and health of boreal and tropical forests (IPCC, 2007a, 2007b).

The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC is an organization of more than 800 scientists from around the world. It regularly publishes summary documents that analyze and consolidate all recent peer-reviewed scientific literature, providing a consensus of the state of the science. Thus, IPCC is viewed by governments, policymakers, and scientists as the leading international body on the science of climate change, and its summaries are considered to be the best available science. IPCC documents address change at the global and super-regional scales. Both IPCC studies and California-specific studies (e.g., California Air Resources Board [ARB], California Energy Commission [CEC], DWR, California Natural Resources Agency [CNRA], and U.S. Bureau of Reclamation [Reclamation]) that are based on IPCC data are referenced throughout this chapter.

The IPCC estimates that the average global temperature rise between the years 2000 and 2100 could range from 1.1°C, with no increase in GHG emissions above year 2000 levels, to 6.4°C, with substantial increase in GHG emissions (IPCC, 2007a). Large increases in global temperatures could have substantial adverse effects on the natural and human environments on the planet and in California.

25.3 Regulatory Setting

GHGs are evaluated and regulated at the federal, State, and local levels. In addition, climate change vulnerability assessment and adaptation and resiliency planning are encouraged (although not regulated or required) at the federal, State, and local levels. Provided below is a list of the applicable climate change and GHG laws, policies, guidance, and plans. These are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this DEIR/EIS.

25.3.1 Federal Plans, Policies, and Regulations

- Draft National Environmental Policy Act Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions (February 2010)
- Greenhouse Gas Reporting (Rule, January 2010)
- Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act (January 2010)

25.3.2 State Plans, Policies, and Regulations

- California Environmental Quality Act Guidelines
- Senate Bill 97 (2007)
- Governor’s Office of Planning and Research Technical Advisory on CEQA and Climate Change (2008)
- Executive Order S-3-05 (2005)
- California Renewables Portfolio Standard Program
- Assembly Bill 32 (California Global Warming Solutions Act of 2006)
- Senate Bill 1368
- Executive Order S-01-07 (2007)
- Executive Order S-13-08 (2008)
- Senate Bill 1771
- Climate Change Scoping Plan (2008)
- California Climate Change Adaptation Strategy (2009)
- California Cap and Trade Program
- Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan
- California Air Pollution Control Officers Association Guidance Documents on Addressing GHGs under CEQA (2008) and Quantifying GHG Mitigation Measures (2010)

25.3.3 Regional and Local Plans, Policies, and Regulations

- Regional and Local Air District Programs
- County General Plans

All of the above laws, policies, guidance, and plans show California’s commitment to reducing GHG emissions and climate change planning and will have important influences on current and future development patterns, behavior, and investments. With respect to the regulation of GHG emissions, California law is already more stringent than federal law, therefore, California entities that meet State level requirements will also comply with federal regulations at this time. California’s key GHG regulation, AB 32, and the regulations and GHG emissions reduction programs that are in place to achieve the goals of AB 32, provide the regulatory framework under which all current and future projects will proceed and the GHG emissions restrictions with which projects will have to comply.

25.4 Greenhouse Gas Emissions

25.4.1 Environmental Setting/Affected Environment

25.4.1.1 Global GHG Emissions

Global GHG emissions due to human activities have increased since pre-industrial times, with an increase of 70 percent occurring between 1970 and 2004. Carbon dioxide (CO_2) is the most important anthropogenic GHG. Its annual emissions grew by approximately 80 percent between 1970 and 2004. An estimated 49 billion metric tons of CO_2 equivalent (CO_2e) per year were emitted by global anthropogenic sources in 2004 (IPCC, 2007a).

Global atmospheric concentrations of CO_2, CH_4, and N_2O have increased markedly as a result of human activities since 1750, and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. Atmospheric concentrations of CO_2 (379 parts per million) and CH_4 (1,774 parts per billion) in 2005 exceed by far the natural range over the last 650,000 years. Global increases in CO_2 concentrations are due primarily to fossil fuel use, with land use change providing another significant, but smaller, contribution (IPCC, 2007a).

25.4.1.2 Principal GHG Emissions that Would be Generated by the Proposed Project

The primary GHGs that would be generated by the proposed Project are CO_2, CH_4, N_2O, and SF_6. Each of these gases is discussed below. Note that PFCs and HFCs are not discussed because these gases are primarily generated by industrial processes, which are not anticipated as part of the proposed Project.

To simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the IPCC reference documents (IPCC, 1996, 2001). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e, which compares the gas in question to that of the same mass of CO_2 (CO_2 has a global warming potential of one by definition).

Table 25-1 lists the global warming potential of CO_2, CH_4, N_2O, and SF_6; their lifetimes; and abundances in the atmosphere in parts per trillion.

Table 25-1
Lifetimes and Global Warming Potential of Several Greenhouse Gases

Greenhouse Gas	Global Warming Potential (100 Years)	Lifetime (Years)	1998 Atmospheric Abundance (ppt)*
Carbon dioxide (CO_2)	1	50 to 200	365,000,000
Methane (CH_4)	21	9 to 15	1,745
Nitrous oxide (N_2O)	310	120	314
Sulfur hexafluoride (SF_6)	23,900	5.6	3,200

*ppt = parts per trillion; 1 ppt is a mixing ratio unit indicating the concentration of a pollutant in ppt by volume.
Source: IPCC, 1996, 2001.

Carbon Dioxide

CO_2 is the most important anthropogenic GHG and accounts for more than 75 percent of all GHG emissions caused by humans. Its atmospheric lifetime of 50 to 200 years ensures that atmospheric concentrations of CO_2 will remain elevated for decades even after mitigation efforts to reduce

GHG concentrations are promulgated (IPCC, 2007a). The primary sources of anthropogenic CO_2 in the atmosphere include the burning of fossil fuels (including motor vehicles), gas flaring, cement production, and land use changes (including deforestation).

Methane

CH_4, the main component of natural gas, is the second most abundant GHG and has a GWP of 21 (IPCC, 1996). Sources of anthropogenic emissions of CH_4 include growing rice, raising cattle, combusting natural gas, landfill off-gassing, and mining coal (NOAA, 2005). Atmospheric CH_4 has increased from a pre-industrial concentration of 715 parts per billion to 1,774 parts per billion in 2005 (IPCC, 2007b).

Nitrous Oxide

N_2O is a powerful GHG, with a GWP of 310 (IPCC, 1996). Anthropogenic sources of N_2O include agricultural processes (e.g., fertilizer application), nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. N_2O also is used in rocket engines, race cars, and as an aerosol spray propellant. In the United States, more than 70 percent of N_2O emissions are related to agricultural soil management practices, particularly fertilizer application. N_2O concentrations in the atmosphere have increased 18 percent from pre-industrial levels of 270 parts per billion to 319 parts per billion in 2005 (IPCC, 2007b).

Sulfur Hexafluoride

SF_6, a human-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, in semiconductor manufacturing, and also as a tracer chemical for the study of oceanic and atmospheric processes (USEPA, 2013). In 2005, atmospheric concentrations of SF_6 were 5.6 parts per billion and steadily increasing in the atmosphere. SF_6 is the most powerful of all GHGs listed in IPCC studies, with a GWP of 23,900 (IPCC, 1996).

25.4.1.3 GHG Emissions Inventories

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources.

Table 25-2 outlines the most recent global, national, and Statewide GHG inventories to provide context of the magnitude of potential proposed Project-related emissions.

Table 25-2
Global, National, and Statewide Annual GHG Emissions Inventories

Emissions Inventory	CO_2e (Metric Tons)
2004 IPCC Global GHG Emissions Inventory	49,000,000,000
2011 USEPA National GHG Emissions Inventory	5,797,300,000
2011 ARB State GHG Emissions Inventory	448,110,000

Notes:

ARB = California Air Resources Board
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
IPCC = Intergovernmental Panel on Climate Change
USEPA = U.S. Environmental Protection Agency

Source: IPCC, 2007a; USEPA, 2013; ARB, 2013.

25.4.2 Environmental Impacts/Environmental Consequences

25.4.2.1 Proposed Project Greenhouse Gas Emissions Analysis

Evaluation Criteria and Thresholds of Significance

Significance criteria represent the environmental thresholds that were used to identify whether an impact would be significant. *CEQA Guidelines* §15064.4 indicates:

(a) The determination of the significance of greenhouse gas emissions calls for a careful judgment by the Lead Agency consistent with the provisions in §15064. A Lead Agency should make a good faith effort, based to the extent possible on scientific and factual data, to describe, calculate, or estimate the amount of greenhouse gas emissions resulting from a project. A Lead Agency shall have discretion to determine, in the context of a particular project, whether to:

  (1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use. The Lead Agency has discretion to select the model or methodology it considers most appropriate provided it supports its decision with substantial evidence. The Lead Agency should explain the limitations of the particular model or methodology selected for use; and/or

  (2) Rely on a qualitative analysis or performance-based standards.

(b) A Lead Agency should consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment:

  (1) The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting.

  (2) Whether the project emissions exceed a threshold of significance that the Lead Agency determines applies to the project.

  (3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of greenhouse gas emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

For the purposes of this analysis, an alternative would result in a significant impact if it would result in the following:

- Generation of Cumulative GHG Emissions

Neither the CEQA nor NEPA Lead Agencies have established quantitative significance thresholds for GHG emissions; instead the proposed Project is evaluated on a case-by-case basis using up-to-date calculation and analysis methods. By enacting the Global Warming Solutions Act of 2006 (AB 32), the State Legislature has established statewide GHG emissions reduction targets. Further, the Legislature has determined that GHG emissions, as they relate to global climate change, are a source of adverse environmental impacts in California and should be addressed pursuant to CEQA. AB 32 did not amend CEQA, although the legislation identifies the myriad environmental problems in California caused by global warming (Health and Safety Code, Section 38501(a)). SB 97, in contrast, added explicit requirements that CEQA analysis address the impacts of GHG emissions (PRC Sections 21083.05 and 21097).

With respect to significance thresholds established for GHG emissions, no State or federal agency with jurisdiction over the NEPA or CEQA Lead Agencies has established a significance threshold that would apply to the proposed Project. Many regional air pollution control districts have established GHG emissions significance thresholds for CEQA purposes. However, these thresholds apply to only stationary sources, such as power plants or factories or to residential or commercial developments. Because the proposed Project is neither a stationary source, nor a residential or commercial development, these thresholds of significance would not apply.

Scientific studies (as best represented by the IPCC's periodic reports) demonstrate that climate change is already occurring due to past GHG emissions. Evidence suggests that global emissions must be reduced below current levels to avoid the most severe climate change impacts. Given the seriousness of climate change and the regional significance of the proposed Project, the proposed Project Lead Agencies have determined that, for the purposes of the proposed Project, any substantial increase in GHG emissions above net zero (0) would result in a significant impact. A net zero threshold represents the most conservative assessment of emissions. Proposed Project Lead Agencies have selected a net zero threshold to be cautious and to avoid under-representing potential impacts.

In accordance with scientific consensus regarding the cumulative nature of GHGs, the analysis provides a cumulative evaluation of GHG emissions. Unlike traditional cumulative impact assessments, this analysis is still project-specific in that it evaluates only direct emissions generated by the proposed Project. Because of the global nature of GHG emissions and impacts that result from those emissions, proposed Project emissions are placed into the context of current *global* atmospheric GHG concentrations and projections of future concentrations. The analysis does not specifically analyze emissions from past, present, and reasonably foreseeable projects in the Primary, Secondary, and Extended study areas.

Impact Assessment Assumptions and Methodology

Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts from greenhouse gas emissions:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., Glenn-Colusa Irrigation District [GCID] Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect

effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the proposed Delevan Pipeline Intake/Discharge facilities would be required.
- Construction activities are anticipated to occur between the hours of 6:00 a.m. and 7:00 p.m. Monday through Friday. Nighttime and weekend construction are not planned, but may occur on an as-needed basis.

Methodology

The proposed Project was evaluated to determine how construction and operations of proposed Project facilities would generate GHG emissions. GHG emissions associated with the proposed Project could contribute to the cumulatively considerable impact of global climate change by adding GHGs to the atmosphere. The discussion below reviews potential generation of GHG emissions for each of the proposed Project's action alternatives. For the purpose of this analysis, only changes in GHG emissions caused by construction and operation of the proposed Project are discussed. The GHG emissions estimated for the proposed Project's Alternatives A, B, and C were compared to Existing Conditions (for CEQA) and to future conditions associated with the No Project/No Action Alternative (for NEPA). Construction-related GHG emissions would result primarily from fuel combustion in construction equipment, trucks, and worker vehicles. To support calculations of GHG emissions, lists of the types and numbers of construction equipment and number of days required for construction of each proposed Project facility were developed by Project engineers, and assumptions were developed about hours of operation for each type of equipment (Barnes pers. comm., 2011).

Equipment-specific hours of use were multiplied by equipment-specific CO_2 emission factors to calculate total equipment emissions for construction of each proposed Project facility. Total CO_2 emissions for each proposed Project facility were estimated by summing the results of the equipment emissions.

For construction, emissions of other GHGs, such as CH_4 and N_2O, were not estimated, due to the lack of equipment-specific emission factors for GHGs other than CO_2. Emissions of CH_4 and N_2O from fuel combustion would be much lower than emissions of CO_2, contributing in the range of two to four percent of total CO_2 emissions. Therefore, it was assumed that CH_4 and N_2O emissions would not substantially contribute to the construction-related GHG emissions.

To estimate GHG emissions from maintenance activities, proposed Project facilities were grouped to reflect activities, personnel, and equipment that might be shared to optimize efficiency. Emissions were estimated for maintenance of the following proposed Project facilities:

- Pumping Plants, Intake and Outlet Facilities, Pumping/Generating Plants
- Reservoirs, Recreation Facilities, Dams, Roads, and Bridges
- Electrical Switchyards and Transmission Lines
- Tunnels, Pipelines, and Canals

DWR has developed estimates of the numbers and types of equipment, vehicles, and personnel needed for maintenance of the facilities (DWR, 2011). Equipment and personnel requirements for maintenance of facilities were assumed to be the same for proposed Project's Alternatives A, B, and C. Maintenance activities include both routine activities and major inspections. Routine activities would occur on a daily basis throughout the year, whereas major inspections would occur annually. Exhaust emissions from equipment and vehicles were calculated using the EMFAC2011 (ARB, 2011) and CalEEMod (CAPCOA, 2013) models, respectively.

Estimating emissions from operation of the alternatives is complex and involves assumptions about the amount and timing of pumping and generating activities, the fuel source used to power pumping operations (fossil sources or renewable sources), and changes in the operation of existing State Water Project (SWP) and Central Valley Project (CVP) facilities as operations of the alternatives are integrated into the existing water delivery system and the California electrical distribution and balancing system. As discussed in Chapter 31 Power Production and Energy and summarized below, the proposed Project's action alternatives would consume energy during the pumping phase of operations, would generate electricity during the release phase of operations, and would be able to provide resource shifting and renewable integration services during pumpback operations. In addition, the seasonal operations of the proposed Project's action alternatives would make them highly conducive to operations during the pumping and generating phases that would likely result in reductions in GHG emissions.

Emissions from operation of the proposed Project's action alternatives were estimated by post processing the CALSIM II modeling runs used to analyze the impacts of the proposed Project's action alternatives throughout this document. CALSIM II provides estimates of the amount of water that would be pumped and released at each of the facilities during each month of the year for various water year types and hydrologic conditions. The pumping and releasing of water can be converted to electricity use and electricity generation by applying assumptions about efficiency of each pumping or generating plant. Chapter 31 Power Production and Energy describes assumptions of the proposed Project's power and energy operations, including pumpback operations and renewable integration services.

Operation of Proposed Project Alternatives

Although each of the proposed Project alternatives has different features and would operate slightly differently, all alternatives share some commonalities among their operations that are important for analysis of GHG emissions.

As discussed in greater detail in Chapter 31 Power Production and Energy, during winter and spring, the proposed Project alternatives would typically function in the pumping phase when excess water flows down the Sacramento River. This is the time of year when hydroelectric generation and wind generation increase and demand for electricity decreases, thus much of the increased electricity load required to pump water out of the Sacramento River and into the reservoirs could be served by renewable electricity sources. Further, the largest electricity load from the proposed Project alternatives comes from lifting water from the proposed Holthouse Reservoir to the proposed Sites Reservoir. The proposed Holthouse Reservoir has been sized to accommodate a large amount of storage (up to six days of fill operations) allowing pumping operations to move water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to occur at night or during other non-peak electricity demand periods or when renewable power is available.

During the summer and fall, the proposed Project alternatives would typically function in the generating phase, as water is released from the reservoirs to meet water supply and water quality objectives. This is the time of year that electricity demand increases to satisfy summer cooling requirements. The release of water from the proposed Sites Reservoir to the proposed Holthouse Reservoir could be timed to meet peak daytime demand for electricity, thereby displacing the need to operate high emissions power plants.

During times of the year when the proposed Project is not functioning in the pumping or generating phase, it could be operated to perform daily pumpback operations. Daily pumpback operations would allow the proposed Project to use power from various high efficiency sources, including renewables, to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir typically during the nights and other low demand periods. Then, during higher demand periods, the water could be released back from the proposed Sites Reservoir to the proposed Holthouse Reservoir to generate electricity. Although this operation would actually consume more electricity than is generated, the net result would typically be reduced GHG emissions because electricity used to pump the water would be very low or zero GHG emissions sources, such as ultra efficient baseload gas fired power plants, nuclear, or renewable, and the generated electricity would displace the least efficient peaking power plants that emit higher levels of GHGs.

In addition to operation of the proposed Project's action alternatives' facilities, the implementation of any of the action alternatives would also result in changes to operations of existing CVP and SWP facilities including:

- Shasta Lake
- San Luis Reservoir
- Folsom Lake
- Trinity Lake
- Lake Oroville
- Banks Pumping Plant
- Jones Pumping Plant

Changes to operations of these facilities as a result of proposed Project operations are described in Chapter 6 Surface Water Resources.

Pumping at Banks and Jones pumping plants would likely increase because of increased water supply reliability created by the proposed Project's alternatives. Thus, additional electricity would be needed to operate the facilities to accommodate integration of the proposed Project facilities and operations.

The combined results of all changes in operation of SWP and CVP facilities are described below for each of the proposed Project's action alternatives.

Appendix 24A provides detailed equipment and emissions tables, emissions factors, and GHG emission calculations for proposed Project construction, operations, and maintenance activities for each of the proposed Project's action alternatives.

GHG Emissions Reduction Project Commitments

Consistent with the requirements of the DWR Greenhouse Gas Emissions Reduction Plan (GGERP) (DWR, 2012a), all construction activities undertaken for the proposed Project would implement DWR's Construction Best Management Practices (BMPs). DWR's Construction BMPs are included in Appendix 25A.

In addition, as described in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives, the proposed Project would: (1) obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and (2) use at least 20 percent of the proposed Project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation.

Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

Impacts Associated with the No Project/No Action Alternative

Impact GHG-1: Generation of Cumulative GHG Emissions

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and if these analyses were completed in the past three years, their potential for GHG emissions impacts has been addressed in those environmental documents.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to cause increases in GHG emissions from human activities. It is also expected that improved emissions controls and lower-emitting technologies would be developed in the future to reduce these emissions, consistent with State goals.

If the No Project/No Action Alternative is implemented, no proposed Project-related facilities would be constructed or operated. Therefore, this alternative would have no direct Project-related construction- or operations-related GHG emissions, when compared to Existing Conditions. In addition, no operations and maintenance of proposed Project-related facilities would occur if the No Project/No Action Alternative is implemented, other than the ongoing systemwide generation and use of electricity by the CVP and SWP facilities. Therefore, **there would not be a substantial adverse effect** from GHG emissions, when compared to Existing Conditions.

Impacts Associated with Alternative A

Impact GHG-1: Generation of Cumulative GHG Emissions

Construction, Operation, and Maintenance of the Proposed Project

Project Construction Emissions

Construction-related GHG emissions would result primarily from fuel combustion in construction equipment, trucks, and worker vehicles, from the production of concrete used for construction, and from the generation of electricity used during construction. Total estimated GHG emissions resulting from construction of Alternative A are summarized in Table 25-3.

Table 25-3
Estimated Total GHG Emissions from Construction of Alternative A (Metric Tons CO_2e)*

Emissions from Mobile Construction Equipment*	Emissions From Concrete Production	Emissions from Construction Electricity Usage/Tunnel Boring Machine	Total Construction-Related Emissions
184,206	47,017	4,297	235,520

*Calculated emissions based on Table 24A. A-5 in Appendix 24A.

The GHG emissions shown in Table 25-3 are the estimated total cumulative CO_2e emissions that would occur over the nine-year construction period of Alternative A. Within the nine-year construction period, annual GHG emissions would fluctuate. Because GHG emissions are well dispersed in the atmosphere and persist for long periods of time (hundreds or thousands of years), estimates of emissions on a yearly basis are less meaningful than the total amount of emissions released during the discrete construction period. After construction is complete, emissions from these sources would cease.

Project Operation and Maintenance Emissions

Once construction is complete, the proposed Alternative A facilities would begin to operate. Unlike construction emissions, operations emissions would occur over a long period of time, i.e., the useful life of the proposed Project. Operation of the proposed Alternative A facilities would involve both the use and generation of electricity, as described in Chapter 31 Power Production and Energy. The amount of GHG emissions from operation of Alternative A would depend on the specific sources of energy used for pumping water into the proposed reservoirs and other operational parameters. Further, electricity needed to pump water into the reservoirs and electricity generated by releasing water from the reservoirs would vary annually and seasonally, depending on hydrologic conditions.

As shown in Table 25-4, operation of the proposed Alternative A facilities (without consideration of pumpback operations) would result in an estimated long-term average net generation of -90 GWh/year (i.e., to operate the Alternative A facilities, all of the energy generated at the facilities would be needed and an additional 90 GWh of energy would be needed from other sources).

Table 25-4
Estimated Electricity Generation and Use from Operation of Alternative A Facilities without Consideration of Pumpback Operations (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative A	Alternative A Minus Existing Conditions	Alternative A Minus No Project/No Action Alternative
Project Facilities[b]						
Energy Generation	Long-Term[c]	0	0	126	126	126
	Dry and Critical[d]	0	0	129	129	129
Pumping Energy Use	Long-Term	13	13	229	217	216
	Dry and Critical	11	12	184	172	172
Net Generation	Long-Term	-13	-13	-103	-90	-90
	Dry and Critical	-11	-12	-54	-43	-43

[a]Results are estimated using the NODOS Power model using data from the CALSIM II model.
[b]Other related Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities are included; this results in non-zero values for Existing Conditions and the No Project/No Action Alternative.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Note:
GWH/year = gigawatt hours per year

Although operation of the proposed Alternative A facilities would result in a long-term average net use of electricity, the way the facilities would be operated and integrated into the California electricity market would actually result in annual reductions in GHG emissions. As discussed in Chapter 31 Power

Production and Energy, water pumping would occur to the extent possible during times when renewable (zero emissions) electricity is available, and releases of water, which generate electricity, would be done to the extent possible when electricity is in high demand. Therefore, electricity generated at the proposed Alternative A facilities – with no emission of GHGs – would offset some of the most inefficient and highest emitting generating resources in the electricity market.

In addition to the analysis provided above, the proposed Alternative A facilities would be configured to allow substantial pumpback operations; i.e., pumping water from the proposed Holthouse Reservoir into the proposed Sites Reservoir during nighttime hours (when excess clean/cheap electricity is available) and then releasing the water back from the proposed Sites Reservoir to the proposed Holthouse during peak demand hours during the day (when the electricity generated can displace high emitting/high cost sources).

Alternative A would also be able to provide critical renewable integration services to the California grid that would facilitate additional renewable energy generation and further reduce GHG emissions. Solar and wind power are intermittent electricity sources; the electricity generated at a solar or wind power station fluctuates unpredictably as clouds obscure the sun or wind speeds decrease. To effectively integrate solar and wind power into an electricity grid, there must be appropriate backup power supplies to ensure that fluctuations in solar or wind generation are smoothed out so that sufficient supply exists in the grid to meet demand. Alternative A could provide this renewable integration service. Both in the pumping and generating phase, Alternative A would have the flexibility to modify its operations to balance generation from intermittent renewable electricity supplies. In the pumping phase, Alternative A would have ample storage at the proposed Holthouse Reservoir and variable speed pumps at the proposed Sites Pumping Plant that could quickly ramp up or down so that pumping from the proposed Holthouse Reservoir to the proposed Sites Reservoir could be slowed or delayed for up to several days to coincide with available renewable electricity. In the generation phase, the proposed Sites Pumping Plant's variable speed turbines could quickly ramp up or ramp down to provide additional generation when renewable electricity decreases or additional pumping load when renewable generation increases.

Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives describes the commitment of the proposed Project to obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and to use at least 20 percent of the proposed Project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation. At this level of renewables use and renewable integration service, operational analyses indicate that implementation of Alternative A would result in GHG emissions reductions of approximately 22,200 metric tons of CO_2e per year (Appendix 25A). This represents a very conservative estimate of the level of renewables that would be used to operate Alternative A and the level of renewable integration service that Alternative A could provide. If Alternative A were operated with 80 percent renewable power for pumping and provided 20 percent of pumping load for integration services, and 100 percent of generated electricity was used for integration services, operational analyses indicate that Alternative A would result in GHG emissions reductions of more than 138,000 metric tons of CO_2e per year. Although operations would vary each year, all of these features would contribute to reducing overall GHG emissions from Alternative A and from the larger California electrical power grid. These two data points represent the likely potential range of GHG emissions reductions that would result from operation of Alternative A.

Maintenance of Alternative A facilities would include regular inspections, land management activities, sediment removal from forebays, and servicing of pumping plants. Estimated emissions from maintenance activities are detailed in Appendix 24A and would total approximately 1,500 metric tons of CO_2e per year.

As discussed in Section 25.4.1, any increase in emissions above net zero associated with Alternative A would be adverse. Construction of Alternative A would generate approximately 236,000 metric tons of CO_2e emissions over the nine-year construction period. Once operations begin, maintenance activities would increase GHG emissions by 1,500 metric tons of CO_2e; however, operations of Alternative A would be expected to reduce annual GHG emissions by between 22,000 and 138,000 metric tons of CO_2e per year (Appendix 25A). Thus, it would take between two and 14 years of operation to completely offset the GHG emissions released during construction. After that time period, operation of Alternative A would contribute to lowering California's GHG emissions and would help California achieve its AB 32 GHG emissions reduction goals.

Because increases in GHG emissions associated with construction of Alternative A would be more than offset by reductions in GHG emissions from operation, there would be no long-term increase over the net-zero threshold. Over the life of the proposed Project, Alternative A would be likely to substantially reduce GHG emissions. Therefore, implementation of Alternative A would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Existing State Water Project Facilities Operational Emissions

Operation of Alternative A would result in modifications to the operations of existing SWP facilities, including Lake Oroville and the Thermalito Complex, and pumping and generating facilities along the California Aqueduct.

Table 25-5 shows that net generation (the amount of energy generated at hydroelectric generating facilities minus the amount of energy used at pumping facilities) would be negative, i.e., Alternative A operation would result in a net increase in the amount of energy needed annually to operate the SWP.

Alternative A operation would add approximately 429 GWh of additional net electricity demand over Existing Conditions on a long-term annual basis and 249 GWh of additional net electricity demand over the No Project/No Action Alternative on a long-term annual basis.

Additional energy needed to operate existing SWP facilities would be purchased by DWR as part of its ongoing energy purchasing and scheduling responsibilities for the SWP. Thus, analysis of the GHG impact of this additional electricity will be analyzed pursuant to the DWR GGERP framework (DWR, 2012a).

Operation of Alternative A would result in additional SWP energy demands in excess of 15 GWh/year; therefore, the GGERP procedure has been followed for projects that would increase SWP energy demand by 15 GWh/year or more.

In the GGERP, DWR developed estimates of historical, current, and future GHG emissions. Figure 25-2 shows those emissions as they were projected in the GGERP and how those emissions projections would change with the additional electricity demands needed to operate the SWP with the addition of Alternative A. As shown in Figure 25-2, in 2022 (the year that Alternative A is projected to go online), DWR total emissions would increase from approximately 977,000 metric tons of CO_2e to nearly 1.16 million metric tons of CO_2e. This elevated level would be approximately 150,000 metric tons of

Table 25-5
Electricity Generation and Use from Expected Changes in Operation at Existing State Water Project Facilities as a Result of Implementation of Alternative A (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative A	Alternative A Minus Existing Conditions	Alternative A Minus No Project/No Action Alternative
SWP Facilities						
Energy Generation	Long-Term[b]	4,326	4,386	4,491	165	105
	Dry and Critical[c]	3,033	2,909	3,143	110	234
Pumping Energy Use	Long-Term	7,848	8,088	8,442	594	354
	Dry and Critical	6,354	6,013	6,768	414	755
Net Generation	Long-Term	-3,522	-3,702	-3,951	-429	-249
	Dry and Critical	-3,321	-3,104	-3,625	-304	-521

[a]Results are estimated using the SWP Power model using data from the CALSIM II model.
[b]Long-Term is the average quantity for the calendar years 1922 to 2002.
[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
GWh/year = gigawatt hours per year
SWP = State Water Project

CO_2e below DWR's designated GHG emissions reduction trajectory red line, which is the linear interpolation between DWR's 2020 GHG emissions goal and DWR's 2050 GHG emissions goal. The projection indicates DWR has already included sufficient excess GHG emissions reductions into its future activities, so that with the addition of 429 GWh of demand associated with Alternative A implementation, DWR would remain below its emissions reduction trajectory and would maintain its downward trajectory toward achieving its GHG emissions reduction goals. The calculations associated with projected emissions are included in Appendix 25A.

Given the scale of additional emissions that Alternative A would add to DWR's total GHG emissions, DWR finds that no additional actions or commitments would be required to implement Alternative A.

As shown in the analysis above and consistent with the analysis contained in the GGERP and associated Initial Study and Negative Declaration for the GGERP, Alternative A would not adversely affect DWR's ability to achieve the GHG emissions reduction goals set forth in the GGERP and would not conflict with any of the specific action GHG emissions reduction measures set forth in the GGERP. Consistent with the programmatic analysis framework set up in the GGERP, Alternative A would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Existing Central Valley Project Facilities Operational Emissions

DWR's GGERP cannot be used to evaluate environmental impacts associated with increased CVP pumping because emissions associated with CVP are not under DWR's control and are not included in the GGERP. Accordingly, GHG emissions resulting from increased CVP energy use are evaluated separately from GHG emissions generated as a result of SWP energy use.

Table 25-6 shows that under Existing Conditions and No Project/No Action Alternative, the CVP would generate approximately 3,590 GWh of excess hydroelectric power. This electricity would be sold into the California electricity market or directly to CVP power users.

Implementation of Alternative A would result in an increase in CVP electricity use of 25 to 28 GWh/year. This additional demand would be served by energy generated at CVP hydroelectric facilities that emit no GHGs, and therefore, would result in no GHG emissions.

With implementation of Alternative A, operation of the CVP would continue to yield a large net generation of clean GHG-emissions-free hydroelectric energy. However, the small increase in electricity usage to operate the CVP with Alternative A would result in a corresponding reduction in the supply of GHG-emissions-free electricity available to sell to California electricity users. This reduction in hydroelectric energy available for sale could result in a potential indirect effect of Alternative A, as electricity users acquire substitute electricity supplies that may result in GHG emissions (although additional conservation is also a possible outcome as well).

Table 25-6
Electricity Generation and Use from Expected Changes in Operation at Existing Central Valley Project Facilities as a Result of Implementation of Alternative A (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative A	Alternative A Minus Existing Conditions	Alternative A Minus No Project/No Action Alternative
CVP Facilities[b]						
Energy Generation	Long-Term[c]	4,712	4,701	4,711	-1	11
	Dry and Critical[d]	3,533	3,513	3,500	-34	-13
Pumping Energy Use	Long-Term	1,124	1,116	1,152	27	36
	Dry and Critical	894	878	902	8	24
Net Generation	Long-Term	3,588	3,585	3,560	-28	-25
	Dry and Critical	2,639	2,635	2,598	-41	-37

[a]Results are estimated using the LT-GEN model using data from the CALSIM II model.
[b]Tehama-Colusa Canal pumping facilities are also reported as Project facilities in Table 25-4.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
CVP = Central Valley Project
GWh/year = gigawatt hours per year

It is unknown what type of power source (e.g., renewable, natural gas) would be substituted for CVP electricity or if some of the lost power would be replaced by higher efficiency power. Given State mandates for renewable energy and incentives for energy efficiency, it is possible that a considerable amount of this power would be replaced by renewable resources or would cease to be needed as a result of higher efficiency. However, to ensure a conservative analysis, indirect emissions were quantified for the entire quantity of electricity (28 GWh) using the current and future statewide energy mix (adjusted to reflect the Renewable Portfolio Standard [RPS]). The RPS requires investor-owned utilities to meet a minimum requirement percentage of their power that is provided by renewable sources each year.

Substitution of 28 GWh of electricity with a mix of sources similar to the current statewide mix (emissions factor of 300.0 metric tons of CO_2e/GWh[1]) would result in emissions of 8,400 metric tons of

1 eGrid 2012 Version 1.0 (Year 2009 data) CAMX subregion emissions factor for total output emissions rate. http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf

CO_2e; however, under expected future conditions (after full implementation of the RPS), emissions would be 6,460 metric tons of CO_2e[2].

These emissions could contribute to a cumulatively considerable effect, and could, therefore, be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. However, these emissions would be caused by dozens of independent electricity users making decisions about different ways to substitute for the lost power. Power purchases by private entities or public utilities in the private marketplace necessitated by a reduction in available CVP-generated hydroelectric power are beyond the control of the Lead Agencies. Further, monitoring to determine the actual indirect change in emissions as a result of Alternative A implementation would not be feasible.

Open Water Surfaces and Tailraces Emissions

Implementation of Alternative A would include the construction of a surface storage reservoir and would result in the conversion of land that is currently used predominantly for cattle grazing to an open water surface. Research indicates that the surfaces of some reservoirs may be emitting or absorbing GHGs at material rates as a result of diffusion of CO_2 and CH_4 from the water into the atmosphere or from the atmosphere into the water. In addition, as stored water passes through hydroelectric turbines, GHGs that had been dissolved in the water come out of solution and are released to the atmosphere (also known as tailrace emissions). These types of emissions could represent sources or sinks of emissions from Alternative A; however, there are several factors that are not yet fully understood that make it difficult to adequately quantify potential emissions rates from the proposed Alternative A surface storage facilities.

These factors have been identified in both the absorption and emission of GHGs from reservoirs and other aquatic systems. In general, organic inputs, soil type and vegetation inundated, water quality parameters (dissolved oxygen, CO_2, and CH_4, temperature, pH), and duration of inundation have all been found to affect the GHG absorption and emissions characteristics of aquatic systems. In addition to these factors, natural aquatic systems have been shown to be the primary pathway in the global carbon cycle for transmitting carbon sequestered at the watershed level back to the atmosphere, into sediment deposition, or as dissolved carbon to the oceans (Cole et al., 2007). Thus, even if emissions from the surface and tailraces of reservoirs could be accurately quantified, it would not be clear whether the emissions of GHGs measured at the reservoir were different from the emissions that would have occurred within the watershed had the reservoir not been built. Because rivers are significant GHG emissions pathways, it is necessary to compare pre-reservoir watershed emissions with post-reservoir watershed emissions to determine the effect of the reservoir.

Recent studies have provided useful information about the potential scale of emissions from open water systems in temperate areas. Fifty-nine hydropower reservoirs, natural lakes, and rivers in the western and southwestern United States have been sampled to date (Soumis et al., 2004). This sampling shows that some reservoirs in California, Oregon, and Washington are GHG sinks and others have gross emissions equal to or less than natural lakes and rivers of the region (Tremblay et al., 2005). These studies suggest that the proposed Sites Reservoir, Holthouse Reservoir, and other open water facilities associated with Alternative A are unlikely to produce substantial GHG emissions.

[2] Assumes a total output emissions rate of 230 $mtCO_2e$/GWh based on shift in generation to 33 percent renewables for retail load.

Further, ARB has determined that, for the purpose of AB 32 Mandatory GHG Accounting, generation of hydroelectric power shall be excluded from the regulation[3]. The USEPA in its eGrid database (USEPA, 2012) of emissions factors for electricity generating facilities also associates a zero emissions factor to hydroelectric power generation. And finally, excluding biogenic sources of emissions from short-term changes in the form of carbon at stages of the active carbon cycle is a widely accepted practice in GHG accounting as indicated by the lack of protocols, guidance, and tools provided for accounting for these emissions in several important GHG protocols including: The GHG Protocol (www.ghgprotocol.org), The Climate Registry (www.theclimateregistry.org), and The American Carbon Registry (www.americancarbonregistry.org).

Based on these studies of emissions from open water systems and considering the zero emissions factor typically assigned to hydroelectric power generation, emissions associated with Alternative A's open water surfaces and tailraces would likely be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. DWR has not quantified emissions from the surface or tailraces of proposed Alternative A facilities because the quantification would be speculative, considering the lack of protocols, guidance, and tools to do so.

Impacts Associated with Alternative B

Impact GHG-1: Generation of Cumulative GHG Emissions

Construction, Operation, and Maintenance of the Proposed Project

Project Construction Emissions

Construction-related GHG emissions associated with Alternative B would result primarily from fuel combustion in construction equipment, trucks, and worker vehicles, and also from the production of concrete used for construction and from the generation of electricity used during construction. Total estimated GHG emissions resulting from construction of Alternative B are summarized in Table 25-7.

Table 25-7
Estimated Total GHG Emissions from Construction of Alternative B (Metric Tons CO_2e)*

Emissions from Mobile Construction Equipment*	Emissions From Concrete Production	Emissions from Construction Electricity Usage/Tunnel Boring Machine	Total Construction-Related Emissions
228,475	50,376	4,297	283,148

*Calculated emissions based on Table 24A. B-5 in Appendix 24A.

The emissions shown in Table 25-7 are the estimated total cumulative CO_2e emissions that would occur over the nine-year construction period of Alternative B. Within the nine-year construction period, annual emissions would fluctuate. Because GHG emissions are well dispersed in the atmosphere and persist for long periods of time (hundreds or thousands of years), estimates of emissions on a yearly basis are less meaningful than the total amount of emissions released during the discrete construction phase. After construction is complete, emissions from these sources would cease.

Once construction is complete, proposed Alternative B facilities would begin to operate. Unlike construction emissions, operations emissions would occur over a long period of time, i.e., the useful life of the proposed Project. Operation of the proposed Alternative B facilities would involve both the use and

[3] California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 10, Article 2, Section 95100.

generation of electricity, as described in Chapter 31 Power Production and Energy. The amount of GHG emissions from operation of Alternative B would depend on the specific sources of energy used for pumping water into the reservoir and other operational parameters. Further, electricity needed to pump water into the reservoirs and electricity generated by releasing water from the reservoirs would vary annually and seasonally, depending on hydrologic conditions.

As shown in Table 25-8, operation of the proposed Alternative B facilities (without consideration of pumpback operations) would result in a long-term average net generation of -79 GWh/year (i.e., to operate the Alternative B facilities, all of the energy generated at the facilities would be needed and an additional 79 GWh of energy would be needed from other sources).

Table 25-8
Estimated Electricity Generation and Use from Operation of Alternative B Facilities without Consideration of Pumpback Operations (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative B	Alternative B minus Existing Conditions	Alternative B minus No Project/No Action Alternative
Project Facilities[b]						
Energy Generation	Long-Term[c]	0	0	104	104	104
	Dry and Critical[d]	0	0	100	100	100
Energy Use	Long-Term	13	13	195	183	182
	Dry and Critical	11	12	106	95	95
Net Generation	Long-Term	-13	-13	-91	-79	-78
	Dry and Critical	-11	-12	-6	5	6

[a]Results are estimated using the NODOS Power model using data from the CALSIM II model.
[b]Other related Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities are included; this results in non-zero values for Existing Condition and No Project/No Action Alternative. Tehama-Colusa Canal pumping facilities are also reported as CVP facilities in Table 25-10.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Note:
GWh/year = gigawatt hours per year

Although operation of the proposed Alternative B facilities would result in a long-term average net use of electricity, the way the facilities would be operated and integrated into the California electricity market would actually result in annual reductions in GHG emissions. As discussed in Chapter 31 Power Production and Energy, water pumping would occur to the extent possible during times when renewable (zero emissions) electricity is available, and releases of water, which generate electricity, would be done to the extent possible when electricity is in high demand. Therefore, electricity generated at the proposed Alternative B facilities – with no emission of GHGs – would offset some of the most inefficient and highest emitting generating resources in the electricity market.

In addition to the analysis provided above, the proposed Alternative B facilities would be configured to allow substantial pumpback operations; i.e., pumping water from the proposed Holthouse Reservoir into the proposed Sites Reservoir during nighttime hours (when excess clean/cheap electricity is available) and then releasing the water back from the proposed Sites Reservoir to the proposed Holthouse Reservoir during peak demand hours during the day (when the electricity generated can displace high emitting/high cost sources).

Alternative B would also be able to provide critical renewable integration services to the California grid that would facilitate additional renewable energy generation and further reduce GHG emissions. Solar and wind power are intermittent electricity sources; the electricity generated at a solar or wind power station fluctuates unpredictably as clouds obscure the sun or wind speeds decrease. To effectively integrate solar and wind power into an electricity grid, there must be appropriate backup power supplies to ensure that fluctuations in solar or wind generation are smoothed out so that sufficient supply exists in the grid to meet demand. Alternative B could provide this renewable integration service. Both in the pumping and generating phase, Alternative B would have the flexibility to modify its operations to balance generation from intermittent renewable electricity supplies. In the pumping phase, the Alternative B would have ample storage at the proposed Holthouse Reservoir and variable speed pumps at the proposed Sites Pumping Plant that could quickly ramp up or down so that pumping from the proposed Holthouse Reservoir to the proposed Sites Reservoir could be slowed or delayed for up to several days to coincide with available renewable electricity. In the generation phase, the proposed Sites Pumping Plant's variable speed turbines could quickly ramp up or ramp down to provide additional generation when renewable electricity decreases or additional pumping load when renewable generation increases.

Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives describes the proposed Project's commitment to obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and to use at least 20 percent of the proposed Project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation. At this level of renewables use and renewable integration service, operational analyses indicate that implementation of Alternative B would result in GHG emissions reductions of approximately 29,400 metric tons of CO_2e per year (Appendix 25A). This represents a very conservative estimate of the level of renewables that would be used to operate Alternative B and the level of renewable integration service that Alternative B could provide. If Alternative B were operated with 80 percent renewable power for pumping and provided 20 percent of pumping load for integration services, and 100 percent of generated electricity was used for integration services, operational analyses indicate that Alternative B would result in GHG emissions reductions of more than 135,600 metric tons of CO_2e per year. Although operations would vary each year, all of these features would contribute to reducing overall GHG emissions from Alternative B and from the larger California electrical power grid. These two data points represent the likely potential range of GHG emissions reductions that would result from operation of Alternative B.

Maintenance of Alternative B facilities would include regular inspections, land management activities, sediment removal from forebays, and servicing of pumping plants. Estimated emissions from maintenance activities are detailed in Appendix 24A and would total approximately 1,500 metric tons of CO_2e per year.

As discussed in Section 25.4.2.1, any increase in emissions above net zero associated with Alternative B would be adverse.

Construction of Alternative B would generate approximately 283,000 metric tons of CO_2e emissions over the nine-year construction period. Once operations begin, maintenance activities would increase GHG emissions by 1,500 metric tons of CO_2e; however, operations of Alternative B would be expected to reduce annual GHG emissions by between 29,400 and 135,600 metric tons of CO_2e per year (Appendix 25A). Thus, it would take between two and 10 years of operation to completely offset the GHG emissions released during construction. After that time period, operation of Alternative B would contribute to lowering California's GHG emissions and would help California achieve its AB 32 GHG emissions reduction goals.

Because increases in GHG emissions from construction would be more than offset by reductions in GHG emissions from operation, there would be no long-term increase over the net-zero threshold. Over the life of the proposed Project, Alternative B would be likely to substantially reduce GHG emissions. Therefore, Alternative B would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Operation and Maintenance Emissions

Existing State Water Project Facilities Operational Emissions

Operation of Alternative B would result in modifications to the operations of existing SWP facilities including Lake Oroville and the Thermalito Complex, and pumping and generating facilities along the California Aqueduct.

Table 25-9 shows that net generation (the amount of energy generated at hydroelectric generating facilities minus the amount of energy used at pumping facilities) would be negative, i.e., Alternative B would result in a net increase in the amount of energy needed annually to operate the SWP.

Table 25-9
Electricity Generation and Use from Expected Changes in Operation at Existing State Water Project Facilities as a Result of Implementation of Alternative B (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative B	Alternative B minus Existing Conditions	Alternative B minus No Project/No Action Alternative
SWP Facilities						
Energy Generation	Long-Term[b]	4,326	4,386	4,493	167	107
	Dry and Critical[c]	3,033	2,909	3,128	96	220
Energy Use	Long-Term	7,848	8,088	8,464	616	376
	Dry and Critical	6,354	6,013	6,727	373	714
Net Generation	Long-Term	-3,522	-3,702	-3,971	-449	-269
	Dry and Critical	-3,321	-3,104	-3,599	-277	-494

[a]Results are estimated using the SWP Power model using data from the CALSIM II model.
[b]Long-Term is the average quantity for the calendar years 1922 to 2002.
[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
GWh/year = gigawatt hours per year
SWP = State Water Project

Alternative B would add approximately 449 GWh of additional net electricity demand over Existing Conditions on a long-term annual basis and 269 GWh of additional net electricity demand over the No Project/No Action Alternative on a long-term annual basis.

Additional energy needed to operate existing SWP facilities would be purchased by DWR as part of its ongoing energy purchasing and scheduling responsibilities for the SWP. Thus, analysis of the GHG impact of this additional electricity will be analyzed pursuant to the DWR GGERP framework (DWR, 2012a).

Operation of Alternative B would result in additional SWP energy demands in excess of 15 GWh/year; therefore, the GGERP procedure has been followed for projects that would increase SWP energy demand by 15 GWh/year or more.

In the GGERP, DWR developed estimates of historical, current, and future GHG emissions. Figure 25-3 shows those emissions as they were projected in the GGERP and how those emissions projections would change with the additional electricity demands needed to operate the SWP with the addition of Alternative B. As shown in Figure 25-3, in 2022 (the year that Alternative B is projected to go online), DWR total emissions would increase from approximately 977,000 metric tons of CO_2e to nearly 1.17 million metric tons of CO_2e. This elevated level would be approximately 145,000 metric tons of CO_2e below DWR's designated GHG emissions reduction trajectory red line, which is the linear interpolation between DWR's 2020 GHG emissions goal and DWR's 2050 GHG emissions goal. The projection indicates DWR has already built in sufficient excess GHG emissions reductions into its future activities that even with the addition of 449 GWh of demand, DWR would remain below its emissions reduction trajectory and would maintain its downward trajectory toward achieving its GHG emissions reduction goals. The calculations associated with projected emissions are included in Appendix 25A.

Given the scale of additional emissions that Alternative B would add to DWR's total GHG emissions, DWR finds that no additional actions or commitments are required to implement Alternative B.

As shown in the analysis above and consistent with the analysis contained in the GGERP and associated Initial Study and Negative Declaration for the GGERP, Alternative B would not adversely affect DWR's ability to achieve the GHG emissions reduction goals set forth in the GGERP and would not conflict with any of the specific action GHG emissions reduction measures set forth in the GGERP. Consistent with the programmatic analysis framework set up in the GGERP, Alternative B would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Existing Central Valley Project Facilities Operational Emissions

DWR's GGERP cannot be used to evaluate environmental impacts associated with increased CVP pumping because emissions associated with CVP are not under DWR's control and are not included in the GGERP. Accordingly, GHG emissions resulting from increased CVP energy use are evaluated separately from GHG emissions generated as a result of SWP energy use.

Table 25-10 shows that under Existing Conditions and No Project/No Action Alternative, the CVP would generate approximately 3,590 GWh of excess hydroelectric power. This electricity would be sold into the California electricity market or directly to energy users.

Implementation of Alternative B would result in an increase of 14 to 17 GWh per year in CVP electricity use. This additional demand would be served by energy generated at CVP hydroelectric facilities that emit no GHGs, and therefore, would result in no GHG emissions.

With implementation of Alternative B, operation of the CVP would continue to yield a large net generation of clean GHG-emissions-free hydroelectric energy. However, the small increase in electricity usage to operate the CVP with Alternative B would result in a corresponding reduction in the supply of GHG-emissions-free electricity available to sell to California electricity users. This reduction in hydroelectric energy available for sale could result in a potential indirect effect from Alternative B, as electricity users acquire substitute electricity supplies that may result in GHG emissions (although additional conservation is also a possible outcome as well).

It is unknown what type of power source (e.g., renewable, natural gas) would be substituted for CVP electricity or if some of the lost power would be made up with higher efficiency. Given State mandates for renewable energy and incentives for energy efficiency, it is possible that a considerable amount of this power would be replaced by renewable resources or would cease to be needed as a result of higher efficiency. However, to ensure a conservative analysis, indirect emissions were quantified for the entire quantity of electricity (32 GWh) using the current and future statewide energy mix (adjusted to reflect the RPS).

Table 25-10
Electricity Generation and Use from Expected Changes in Operation at Existing Central Valley Project Facilities as a Result of Implementation of Alternative B (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative B	Alternative B Minus Existing Conditions	Alternative B Minus No Project/No Action Alternative
CVP Facilities[b]						
Energy Generation	Long-Term[c]	4,712	4,701	4,718	6	18
	Dry and Critical[d]	3,533	3,513	3,506	-27	-6
Energy Use	Long-Term	1,124	1,116	1,147	23	32
	Dry and Critical	894	878	902	8	25
Net Generation[d]	Long-Term	3,588	3,585	3,571	-17	-14
	Dry and Critical	2,639	2,635	2,604	-35	-31

[a]Results are estimated using the LT-GEN model using data from the CALSIM II model.
[b]Tehama-Colusa Canal pumping facilities are also reported as Project facilities in Table 25-8.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
CVP = Central Valley Project
GWh/year = gigawatt hours per year

Substitution of 32 GWh of electricity with a mix of sources similar to the current statewide mix (emissions factor of 300.0 mtCO_2e/GWh[4]) would result in emissions of 9,600 metric tons of CO_2e; however, under expected future conditions (after full implementation of the RPS), emissions would be 7,360 metric tons of CO_2e[5].

These emissions could contribute to a cumulatively considerable effect, and could, therefore, be a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. However, these emissions would be caused by dozens of independent electricity users making decisions about different ways to substitute for the lost power. Power purchases by private entities or public utilities in the private marketplace necessitated by a reduction in available CVP-

4 eGrid 2012 Version 1.0 (Year 2009 data) CAMX subregion emissions factor for total output emissions rate. http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf
5 Assumes a total output emissions rate of 230 mtCO_2e/GWh based on shift in generation to 33 percent renewables for retail load.

generated hydroelectric power are beyond the control of the Lead Agencies. Further, monitoring to determine the actual indirect change in emissions as a result of Alternative B would not be feasible.

Open Water Surfaces and Tailraces Emissions

Refer to the **Impact GHG-1** discussion for Alternative A for open water surfaces and tailraces. That discussion also applies to Alternative B.

Impacts Associated with Alternative C

Impact GHG-1: Generation of Cumulative GHG Emissions

Construction, Operation, and Maintenance of the Proposed Project

Project Construction Emissions

Construction-related GHG emissions would result primarily from fuel combustion in construction equipment, trucks, and worker vehicles, and also from the production of concrete used for construction and from the generation of electricity used during construction. Total GHG emissions resulting from construction of Alternative C are summarized in 25-11.

Table 25-11
Estimated Total GHG Emissions from Construction of Alternative C (Metric Tons CO_2e)*

Emissions from Mobile Construction Equipment*	Emissions From Concrete Production	Emissions from Construction Electricity Usage/Tunnel Boring Machine	Total Construction-Related Emissions
228,475	50,376	4,297	283,148

*Calculated emissions based on Table 24A. B-5 in Appendix 24A.

The emissions shown in Table 25-11 are the estimated total cumulative CO_2e emissions that would occur over the nine-year construction period of Alternative C. Within the nine-year construction period, annual emissions would fluctuate. Because GHG emissions are well dispersed in the atmosphere and persist for long periods of time (hundreds or thousands of years), estimates of emissions on a yearly basis are less meaningful than the total amount of emissions released during the discrete construction phase. After construction is complete, emissions from these sources would cease.

Once construction is complete, proposed Alternative C facilities would begin to operate. Unlike construction emissions, operations emissions would occur over a long and unknown period of time, i.e., the useful life of the proposed Project. Operation of the proposed Alternative C facilities would involve both the use and generation of electricity, as described in Chapter 31 Power Production and Energy. The amount of GHG emissions from operation of Alternative C would depend on the specific sources of energy used for pumping water into the reservoir and other operational parameters. Further, electricity needed to pump water into the reservoirs and electricity generated by releasing water from the reservoirs would vary annually and seasonally, depending on hydrologic conditions.

As shown in Table 25-12, operation of the Alternative C facilities (without consideration of pumpback operations) would result in a long-term average net generation of -108 GWh/year (i.e., to operate the Alternative C facilities, all of the energy generated at the facilities would be needed and an additional 108 GWh of energy would be needed from other sources).

Although operation of the Alternative C facilities would result in a long-term average net use of electricity, the way the facilities would be operated and integrated into the California electricity market would actually result in annual reductions in GHG emissions. As discussed in Chapter 31 Power Production and Energy, water pumping would occur to the extent possible during times when renewable (zero emissions) electricity is available, and releases of water, which generate electricity, would be done to the extent possible when electricity is in high demand. Therefore, electricity generated at the proposed Alternative C facilities – with no emission of GHGs – would offset some of the most inefficient and highest emitting generating resources in the electricity market.

Table 25-12
Estimated Electricity Generation and Use from Operation of Alternative C Facilities without Consideration of Pumpback Operations (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative C	Alternative C Minus Existing Conditions	Alternative C Minus No Project/No Action Alternative
Project Facilities[b]						
Energy Generation	Long-Term[c]	0	0	157	157	157
	Dry and Critical[d]	0	0	173	173	173
Energy Use	Long-Term	13	13	278	265	265
	Dry and Critical	11	12	199	188	11
Net Generation	Long-Term	-13	-13	-121	-108	-108
	Dry and Critical	-11	-12	-26	-15	-14

[a]Results are estimated using the NODOS Power model using data from the CALSIM II model.
[b]Other related Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities are included; this results in non-zero values for Existing Condition and No Project/No Action Alternative. Tehama-Colusa Canal pumping facilities are also reported as CVP facilities in Table 25-14.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Note:
GWh/year = gigawatt hours per year

In addition to the analysis provided above, the proposed Alternative C facilities would be configured to allow substantial pumpback operations; i.e., pumping water from the proposed Holthouse Reservoir into the proposed Sites Reservoir during nighttime hours (when excess clean/cheap electricity is available) and then releasing the water back from the proposed Sites Reservoir to the proposed Holthouse Reservoir during peak demand hours during the day (when the electricity generated can displace high emitting/high cost sources).

Alternative C would also be able to provide critical renewable integration services to the California grid that would facilitate additional renewable energy generation and further reduce GHG emissions. Solar and wind power are intermittent electricity sources; the electricity generated at a solar or wind power station fluctuates unpredictably as clouds obscure the sun or wind speeds die down. To effectively integrate solar and wind power into an electricity grid, there must be appropriate backup power supplies to ensure that fluctuations in solar or wind generation are smoothed out so that sufficient supply exists in the grid to meet demand. Alternative C could provide this integration service. Both in the pumping and generating phase, the Alternative C would have the flexibility to modify its operations to balance generation from intermittent renewable electricity supplies. In the pumping phase, has Alternative C would have ample storage at the proposed Holthouse Reservoir and variable speed pumps at the proposed Sites Pumping Plant that could quickly ramp up or down so that pumping from the proposed Holthouse Reservoir to the proposed Sites Reservoir could be slowed or delayed for up to several days to coincide with available renewable electricity. In the generation phase, the proposed Sites Pumping Plant's variable speed turbines could quickly ramp up or ramp down to provide additional generation when renewable electricity decreases or additional pumping load when renewable generation increases.

Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives describes the proposed Project's commitment to obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and to use at least 20 percent of the proposed Project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation. At this level of renewables use and renewable integration service, operational analyses indicate that Alternative C would result in GHG emissions reductions of approximately 25,000 metric tons of CO_2e per year (Appendix 25A). This represents a very conservative estimate of the level of renewables that would be used to operate Alternative C and the level of renewable integration service that Alternative C could provide. If Alternative C were operated with 80 percent renewable power for pumping and provided 20 percent of pumping load for integration services, and 100 percent of generated electricity was used for integration services, operational analyses indicate that Alternative C would result in GHG emissions reductions of more than 147,500 metric tons of CO_2e per year. Although operations would vary each year, all of these features would contribute to reducing overall GHG emissions from Alternative C and from the larger California electrical power grid. These two data points represent the likely potential range of GHG emissions reductions that would result from operation of Alternative C.

Maintenance of Alternative C facilities would include regular inspections, land management activities, sediment removal from forebays, and servicing of pumping plants. Estimated emissions from maintenance activities are detailed in Appendix 24A and would total approximately 1,500 metric tons of CO_2e per year.

As discussed in Section 25.4.2.1, any increase in emissions above net zero associated with Alternative C would be adverse.

Construction of Alternative C would generate approximately 283,000 metric tons of CO_2e emissions over the nine-year construction period. Once operations begin, maintenance activities would increase GHG emissions by 1,500 metric tons of CO_2e; however, operations of Alternative C would be expected to reduce annual GHG emissions by between 25,000 and 147,500 metric tons of CO_2e per year (Appendix 25A). Thus, it would take between two and 12 years of operation to completely offset the GHG emissions released during construction. After that time period, operation of Alternative C would contribute to lowering California's GHG emissions and would help California achieve its AB 32 GHG emissions reduction goals.

Because increases in GHG emissions from construction would be more than offset by reductions in GHG emissions from operation, there would be no long-term increase over the net-zero threshold. Over the life of the proposed Project, Alternative C would be likely to substantially reduce GHG emissions. Therefore, Alternative C would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Operation and Maintenance Emissions

Existing State Water Project Facilities Operational Emissions

Operation of Alternative C would result in modifications to the operations of existing SWP facilities including Lake Oroville and the Thermalito Complex, and pumping and generating facilities along the California Aqueduct.

Table 25-13 shows that net generation (the amount of energy generated at hydroelectric generating facilities minus the amount of energy used at pumping facilities) would be negative, i.e., Alternative C would result in a net increase in the amount of energy needed annually to operate the SWP.

Table 25-13
Electricity Generation and Use from Expected Changes in Operation at Existing State Water Project Facilities as a Result of Implementation of Alternative C (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative C	Alternative C Minus Existing Conditions	Alternative C Minus No Project/No Action Alternative
SWP Facilities						
Energy Generation	Long-Term[b]	4,326	4,386	4,496	170	110
	Dry and Critical[c]	3,033	2,909	3,168	136	259
Energy Use	Long-Term	7,848	8,088	8,473	625	385
	Dry and Critical	6,354	6,013	6,848	494	834
Net Generation	Long-Term	-3,522	-3,702	-3,977	-455	-275
	Dry and Critical	-3,321	-3,104	-3,679	-358	-575

[a]Results are estimated using the SWP Power model using data from the CALSIM II model.
[b]Long-Term is the average quantity for the calendar years 1922 to 2002.
[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
GWh/year = gigawatt hours per year
SWP = State Water Project

Alternative C would add approximately 455 GWh of additional net electricity demand over Existing Conditions on a long-term annual basis and 275 GWh of additional net electricity demand over the No Project/No Action Alternative on a long-term annual basis.

Additional energy needed to operate existing SWP facilities would be purchased by DWR as part of its ongoing energy purchasing and scheduling responsibilities for the SWP. Thus, analysis of the GHG impact of this additional electricity will be analyzed pursuant to the DWR GGERP framework (DWR, 2012a).

Operation of Alternative C would result in additional SWP energy demands in excess of 15 GWh/year; therefore, the GGERP procedure has been followed for projects that would increase SWP energy demand by 15 GWh/year or more.

In the GGERP, DWR developed estimates of historical, current, and future GHG emissions. Figure 25-4 shows those emissions as they were projected in the GGERP and how those emissions projections would change with the additional electricity demands needed to operate the SWP with the addition of Alternative C. As shown in Figure 25-4, in 2022 (the year that Alternative C is projected to go online), DWR total emissions would increase from approximately 977,000 metric tons of CO_2e to nearly 1.18 million metric tons of CO_2e. This elevated level is still approximately 140,000 metric tons of CO_2e below DWR's designated GHG emissions reduction trajectory red line, which is the linear interpolation between DWR's 2020 GHG emissions goal and DWR's 2050 GHG emissions goal. The projection indicates DWR has already built in sufficient excess GHG emissions reductions into its future activities that even with the addition of 455 GWh of demand, DWR would remain below its emissions reduction trajectory and would maintain its downward trajectory toward achieving its GHG emissions reduction goals. The calculations associated with projected emissions are included in Appendix 25A.

Given the scale of additional emissions that Alternative C would add to DWR's total GHG emissions, DWR finds that no additional actions or commitments are required to implement Alternative C.

As shown in the analysis above and consistent with the analysis contained in the GGERP and associated Initial Study and Negative Declaration for the GGERP, Alternative C would not adversely affect DWR's ability to achieve the GHG emissions reduction goals set forth in the GGERP and would not conflict with any of the specific action GHG emissions reduction measures set forth in the GGERP. Consistent with the programmatic analysis framework set up in the GGERP, Alternative C would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Existing Central Valley Project Facilities Operational Emissions

DWR's GGERP cannot be used to evaluate environmental impacts associated with increased CVP pumping, as emissions associated with CVP are not under DWR's control and are not included in the GGERP. Accordingly, GHG emissions resulting from increased CVP energy use are evaluated separately from GHG emissions generated as a result of SWP energy use.

Table 25-14 shows that under Existing Conditions and No Project/No Action Alternative, the CVP would generate approximately 3,590 GWh of excess hydroelectric power. This electricity would be sold into the California electricity market or directly to energy users.

Table 25-14
Electricity Generation and Use from Expected Changes in Operation at Existing Central Valley Project Facilities as a Result of Implementation of Alternative C (GWh/Year)[a]

		Existing Conditions	No Project/No Action Alternative	Alternative C	Alternative C Minus Existing Conditions	Alternative C Minus No Project/No Action Alternative
CVP Facilities[b]						
Energy Generation	Long-Term[c]	4,712	4,701	4,715	3	14
	Dry and Critical[d]	3,533	3,513	3,479	-54	-34
Energy Use	Long-Term	1,124	1,116	1,155	31	40
	Dry and Critical	894	878	901	8	24
Net Generation[d]	Long-Term	3,588	3,585	3,559	-28	-26
	Dry and Critical	2,639	2,635	2,578	-62	-58

[a]Results are estimated using the LT-GEN model using data from the CALSIM II model.
[b]Tehama-Colusa Canal pumping facilities are also reported as Project facilities in Table 25-12.
[c]Long-Term is the average quantity for the calendar years 1922 to 2002.
[d]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
Notes:
CVP = Central Valley Project
GWh/year = gigawatt hours per year

Implementation of Alternative C would result in an increase of 26 to 28 GWh per year in CVP electricity use. This additional demand would be served by energy generated at CVP hydroelectric facilities that emit no GHGs, and therefore, would result in no GHG emissions.

With implementation of Alternative C, operation of the CVP would continue to yield a large net generation of clean GHG-emissions-free hydroelectric energy. However, the small increase in electricity usage to operate the CVP with Alternative C would result in a corresponding reduction in the supply of GHG-emissions-free electricity available to sell to California electricity users. This reduction in hydroelectric energy available for sale could result in a potential indirect effect from Alternative C, as electricity users acquire substitute electricity supplies that may result in GHG emissions (although additional conservation is also a possible outcome as well).

It is unknown what type of power source (e.g., renewable, natural gas) would be substituted for CVP electricity or if some of the lost power would be made up with higher efficiency. Given State mandates for renewable energy and incentives for energy efficiency, it is possible that a considerable amount of this power would be replaced by renewable resources or would cease to be needed as a result of higher efficiency. However, to ensure a conservative analysis, indirect emissions were quantified for the entire quantity of electricity (28 GWh) using the current and future statewide energy mix (adjusted to reflect the RPS).

Substitution of 28 GWh of electricity with a mix of sources similar to the current statewide mix (emissions factor of 300.0 mtCO_2e/GWh[6]) would result in emissions of 8,400 metric tons of CO_2e; however, under expected future conditions (after full implementation of the RPS), emissions would be 6,460 metric tons of CO_2e[7].

These emissions could contribute to a cumulatively considerable effect, and could, therefore, be a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. However, these emissions would be caused by dozens of independent electricity users making decisions about different ways to substitute for the lost power. Power purchases by private entities or public utilities in the private marketplace necessitated by a reduction in available CVP-generated hydroelectric power are beyond the control of the Lead Agencies. Further, monitoring to determine the actual indirect change in emissions as a result of Alternative C would not be feasible.

Open Water Surfaces and Tailraces

Refer to the **Impact GHG-1** discussion for Alternative A for open water surfaces and tailraces. That discussion also applies to Alternative C.

Mitigation Measures

Mitigation measures are provided below and summarized in Table 25-15 for the impacts that have been identified as significant or potentially significant.

Because monitoring to determine the actual indirect change in emissions as a result of proposed Project operations would not be feasible, and because power purchases by private entities or public utilities in the private marketplace necessitated by a reduction in available CVP-generated hydroelectric power are beyond the control of the Lead Agencies, there are no feasible mitigation measures that could reduce this

[6] eGrid 2012 Version 1.0 (Year 2009 data) CAMX subregion emissions factor for total output emissions rate. http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf

[7] Assumes a total output emissions rate of 230 mtCO_2e/GWh based on shift in generation to 33 percent renewables for retail load.

potential impact to a less-than-significant level. This impact would, therefore, remain **potentially significant and unavoidable.**

Table 25-15
Summary of Mitigation Measures for NODOS Project Impacts from Greenhouse Gas Emissions

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact GHG-1: Generation of Cumulative GHG Emissions	CVP Operational Emissions	Potentially Significant	No Feasible Mitigation	Potentially Significant and Unavoidable

Note:
LOS = Level of Significance

25.5 Climate Change

25.5.1 Environmental Setting/Affected Environment

25.5.1.1 Climate

Hot dry summers and mild rainy winters characterize the Mediterranean climate of the Sacramento Valley. During the year, the temperature ranges from 25°F to 105°F, with average annual rainfall approximately 20 inches and snowfall very rare (CIMIS, 2011 and WRCC, 2011). The prevailing winds are moderate in strength, and vary from moist clean breezes from the south to dryland flows from the north. Summer conditions in the northern Sacramento Valley Air Basin are typically characterized by high temperatures and low humidity, with prevailing winds from the south. Winter conditions are characterized by rainstorms interspersed with stagnant and sometimes foggy weather. Winter daytime temperatures average in the low 50s and nighttime temperatures average in the high 30s. During winter, north winds become more frequent, but winds from the south predominate. Rainfall occurs mainly from late October to early May.

Table 25-16 provides climate summaries for selected locations in Glenn and Colusa counties. As shown, the counties are similar in temperature, but differ in levels of precipitation and snowfall.

Table 25-16
Climatic Conditions in Glenn and Colusa Counties

Parameter	Glenn County (Willows)[a]	Colusa County (Colusa)[b]
Average Maximum Temperature (°F)	75.0	75.0
Average Minimum Temperature (°F)	47.5	47.6
Average Total Precipitation (inches)	18.29	16.43
Average Total Snowfall (inches)	0.5	0.1

[a]Period of record for the City of Willows: 7/1/1948 to 12/31/2005.
[b]Period of record for the City of Colusa: 10/1/1948 to 12/31/2005.
Notes:
°F = degrees Fahrenheit
Source: Desert Research Institute, Western Regional Climate Center, 2009.

25.5.1.2 Global Climate Trends

Recent Trends

A vast amount of scientific research on climate change, both its causes and effects, at all geographic scales has been conducted during the last 50 years. Scientific measurements have shown that changes in the *global* climate system are already occurring. These include: rising air temperatures; rising ocean temperatures; rising ocean salinity; rising global sea levels; changes in precipitation patterns; and increased intensity and frequency of extreme events such as storms, droughts, and wildfires (IPCC, 2007b; DWR 2009).

The Earth's average surface temperature rose by 0.74±0.18 °C (1.33±0.32°F) over the period 1906 to 2005. The rate of warming over the last half of that period was almost double that for the period as a whole (IPCC, 2007a). Fourteen of the 15 years from 1997 to 2011 rank among the 15 warmest years in the instrumental record of global average temperature (going back to 1880) (Blunden and Arndt, 2012).

During the same period over which this increased global warming has occurred, many other changes have occurred in other natural systems. Sea levels have risen on average 1.8 millimeters (0.07 inch) per year; precipitation patterns throughout the world have shifted, with some areas becoming wetter and others drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snowfed rivers has shifted earlier; and numerous other changed conditions have been observed. Although it is difficult to prove a definitive cause and effect relationship between global warming and other observed changes to natural systems, there is high confidence in the scientific community that these changes are a direct result of increased global temperatures (IPCC, 2007a).

Much of the western United States has experienced warming during the 20th century (roughly 2°F [1.1°C]) and is projected to experience further warming during the 21st century with central estimates varying from roughly 5°F to 7°F (2.8°C to 3.8°C), depending on location (Reclamation, 2011a). Historical trends in annual precipitation are less apparent. Future projections suggest that the northwestern and north-central portions of the United States gradually may become wetter (e.g., Columbia Basin and Missouri River basin) while the southwestern and south-central portions may gradually become drier (e.g., San Joaquin, Truckee, and Rio Grande river basins and the Middle to Lower Colorado River Basin). Areas in between have median projected changes closer to no change, meaning they have roughly equal chances of becoming wetter or drier (e.g., Klamath and Sacramento basins and the Upper Colorado Basin). These summary statements refer to median projected changes in temperature and precipitation, characterized generally across the western United States. Projections show that there is significant variability and uncertainty about these projected conditions both geographically and with time (Reclamation, 2011a).

Warming trends appear to have led to a shift in cool season precipitation toward more rain and less snow, which has caused increased rainfall runoff volume during the cool season accompanied by less snowpack accumulation in some western United States locations (Reclamation, 2011a). Hydrologic analyses-based future climate projections suggest that warming and associated loss of snowpack will persist over much of the western United States. However, there are some geographic contrasts. Snowpack losses are projected to be greatest where the baseline climate is closer to freezing thresholds (e.g., lower lying valley areas and lower altitude mountain ranges). It also appears that, in high altitude and high latitude areas, there is a chance that cool season snowpack actually could increase during the 21st century (e.g., Columbia headwaters in Canada, Colorado headwaters in Wyoming), because precipitation increases are projected and appear to offset the snow-reduction effects of warming in these locations (Reclamation, 2011a).

Average sea level rise over the period 1961 to 2003 was 1.8 millimeters (0.07 inch) per year. Over the period of 1993 to 2003, the rate of sea level rise increased to 3.1 millimeters (0.12 inch) per year. Total average worldwide sea level rise over the 20th century has been 6.7 inches (IPCC, 2007a). Observed trends in sea level rise can be attributed to both thermal expansion of the world's oceans and the melting of ice sheets (polar and alpine). Also during a similar period (1900 to 2007), measurements have shown increases in global ocean temperature (since 1961); a decline in the extent of mountain glaciers and global snow cover; increased atmospheric water vapor content; loss in mass of the polar ice sheets; decreased extent of Arctic sea ice; increased precipitation in the eastern portions of North and South America, northern Europe and northern and central Asia; drying conditions in the Sahel region of the Sahara Desert in Africa, the Mediterranean, and southern Africa; strengthening in mid-latitude westerly winds (since the 1960s); more intense and longer drought conditions in the tropics and sub-tropics (since the 1970s); increased frequency of extreme precipitation events over land areas; higher average night time temperatures; decreased frost days and increased frequency and duration of extreme heat events (since the 1950s); and increased tropical cyclone activity in the North Atlantic (IPCC, 2007a). There may also be additional synergistic impacts of extreme weather events, such as the sea level rise coupled with high tide and extreme storm surges. The above listed changes are, in turn, resulting in changes to the climate of California as the regional climate is moderated by sea surface temperature, westerly wind patterns, the El Niño Southern Oscillation (ENSO), and Pacific storm patterns.

Projections to 2100

Climate models indicate that global average surface temperature will increase at a rate of approximately 0.4°F (0.2°C) per decade for the period 2000 to 2020, and will increase by at least that amount per decade during the period 2020 to 2080. Based on a number of emissions scenarios, the IPCC projected an average increase in surface temperatures of 3.2 to 7.2°F by 2100 compared to 1980 through 1999 levels, with a likely range of 2.0 to 11.5°F when accounting for the uncertainty in climate science (IPCC, 2007a). Approximately half of this warming is the result of past GHG emissions and will occur even if GHG emissions were halted at 2000 levels. Some regions of the globe, particularly high latitudes, will experience much larger changes relative to Existing Conditions. Corresponding global average sea level rise during the period 2000 to 2100 are estimated to be between seven inches (18 centimeters) and 23 inches (58 centimeters) (IPCC, 2007a). However, recent scientific data now strongly suggests that these sea level rise projections are likely too low and that actual sea level rise may be significantly greater than initially estimated (Rahmstorf, 2007; NRC, 2012).[8]

The following additional changes to the global climate system are projected: increased ocean acidity due to increased carbon dioxide uptake by the oceans; reduced global snow cover; increased thaw depth in permafrost regions; decrease in sea ice with potential full disappearance in summer months; increased frequency in heat waves and heavy precipitation events; increased intensity of tropical cyclone events; northward movement of extra-tropical storm tracks; increased precipitation at high latitudes and decreased precipitation in tropical and sub-tropical regions; and increased melting of the ice sheets (IPCC, 2007a).

[8] California agencies, including the Bay Conservation and Development Commission (BCDC) and DWR, are using the more recent data of Rahmstorf et al. 2007 in their sea level rise planning efforts in lieu of the estimates reported by IPCC in the Fourth Assessment Report.

25.5.1.3 Climate Change Effects on California

Recent Trends

Scientific measurements and observations indicate that California's climate is already changing in a manner consistent with what would be expected from global climate change. Since 1920, California's average temperature has been increasing, although this change, or any climate change impact, is not uniform across California. Nighttime temperatures are rising across California and at a higher rate than daytime temperatures. Further, daytime and nighttime heat wave events throughout California have increased in intensity, particularly the nighttime component (Moser et al., 2009).

Water level measurements from the San Francisco gage (CA Station ID: 9414290) indicate that mean sea level rose by an average of 2.01 millimeters (mm) (0.08 inch) per year from 1897 to 2006, equivalent to a change of eight inches in the last century (CCCC, 2009).

California's water supply system is dependent on snowpack storage in the Sierra Nevada. Temperatures over the Sierra Nevada have increased during the last 100 years, resulting in less snowfall (and more rainfall) and an earlier snowmelt (Moser et al., 2009). From 1930 to 2009, the peak timing of Sierra Nevada runoff analyzed by Kapnick and Hall (2009) exhibited a trend toward earlier in the season of 0.4 day per decade. The average early spring snowpack in the Sierra Nevada has decreased by approximately 10 percent since the early 20th century, a loss of 1.5 million acre-feet of snowpack storage (DWR, 2008).

Data also show evidence for the following additional changes to California climate and conditions during the last 50 years: the warming of Lake Tahoe; decreasing chill hours and increased stresses on California agriculture; shifts and disturbances in managed landscapes; increased frequency of wildfire; changes in Santa Ana winds; increases in photochemical smog production in southern California; increased frequency and intensity of heat wave events; changes in the El Niño Southern Oscillation and the impact on California temperatures; and changes in extreme precipitation events and daily average precipitation (CEC, 2011).[9]

Plants and animals around the globe are already reacting to changes caused by increasing temperatures. In California, species are also reacting to extreme conditions, including heat waves (and the fires generated by that heat), cold snaps, droughts (and the Delta saltwater intrusion that droughts often cause), floods, and coastal upwelling. Observed changes also include altered timing of animal and plant lifecycles (phenology), disruption of biotic interactions, changes in physiological performance, species range and abundance, increase in invasive species, altered migration patterns of fishes, aquatic-breeding amphibians, birds and mammals, changes in forage base, local extinction of plant and animal populations, and changes in habitat, vegetation structure, and plant and animal communities (DFG, 2010).

Projections to 2100

Average annual surface temperatures for California are projected to increase by between 2°F and 5°F by 2050 and between 4°F and 9°F by 2100, depending on the GHG emissions scenario assumed. Warming will not be uniform seasonally or across California. Climate models project a greater amount of warming during summer months, during nighttime, and in the interior regions of California. Chill hours in the Central Valley are expected to decrease, but unprecedented extremes of cold weather are still possible (Gershunov, 2011). Changes in temperature and humidity have implications for agriculture in the Central

[9]The State of California under the auspices of the California Energy Commission (CEC) is conducting comprehensive and detailed research into a range of climate change impacts in California as well as research aimed at developing adaptation strategies to deal with impacts already underway and that can no longer be avoided. The majority of this research is available through the California Climate Change Portal. Available at: <http://www.climatechange.ca.gov/>.

Valley; as the climate warms, crop diversity and production will be affected by unpredictability associated with the changing climate (Jackson et al., 2011). Extreme events will also stress California's energy system (Auffhammer, 2011).

Best available data indicate that California, as a whole, will experience changes in precipitation. It is likely that some areas in California will experience higher annual rainfall amounts and precipitation in other regions will decrease (Gershunov, 2011). Cayan et al. (2009) estimates California, particularly southern California, will be 15 to 35 percent drier by 2100. Snowpack volumes are expected to diminish by 25 percent by 2050 (DWR, 2008).

Frequency and intensity of large storms and precipitation events may be influenced by changes in atmospheric rivers. An atmospheric river is a narrow band of concentrated moisture in the atmosphere that transports large amounts of water vapor. In California, nearly all major historic flood events have been associated with the presence of atmospheric rivers, which form in fall and winter and transport warm moister air from the tropical Pacific near Hawaii to the Pacific coast of the continental United States. It is estimated that future changes in climate will increase the frequency of years with atmospheric river storms, but the number of storms per year is not likely to be affected. More importantly, occasional "much-larger-than-historical-range storm intensities" are projected to occur under most warming scenarios. Changes in the frequency and magnitude of atmospheric rivers may result in increases in major flood and storm events (Dettinger, 2011).

Sea level rise along the California coast is expected to accelerate during the 21st century. A recent study completed by the National Research Council (NRC) looked at both global (e.g., thermal expansion, land ice melting) and local (e.g., tectonic land movement, localized subsidence) factors affecting sea level relative to land surface. Table 25-17 shows the projection and the range of uncertainty for expected sea level rise along the coast of San Francisco at 2030, 2050, and 2100.

Table 25-17
Sea Level Rise Projections and Ranges for San Francisco, California 2030, 2050, and 2100

Location	Units	2030		2050		2100	
		Projection	Range	Projection	Range	Projection	Range
San Francisco	cm	14.4 ± 5.0	4.3 to 29.7	28.0 ± 9.2	12.3 to 60.8	91.9 ± 25.5	42.4 to 166.4
	in	5.7±2	1.7 to 11.7	11±3.6	4.84 to 23.9	36.2±10	16.7 to 65.5

Notes:
cm = centimeter
in = inch
Source: NRC, 2012.

Sea level rise will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Sacramento-San Joaquin Delta (Delta), and will intensify the difficulty of managing the Delta as the heart of the State's water supply system (DWR, 2008).These changes in temperature, precipitation, and sea level may have substantial effects on other resources areas. Potential effects of climate change anticipated in California (and discussed in this chapter) are listed below (CNRA, 2009):

- Increased average temperatures (air, water, and soil)
- Changes in annual precipitation amounts

- Change from snowfall (and spring snowmelt) to rainfall
- Decreased Sierra snowpack (earlier runoff, reduced maximum storage)
- Increased evapotranspiration
- Increased frequency and intensity of Pacific storms (flood events)
- Increased severity of droughts
- Increased frequency and severity of extreme heat events
- Increased frequency and severity of wildfire events
- Sea level rise (with increased salt water intrusion in the Delta)
- Changes in species distribution and ranges
- Decreased number of species
- Increased number of vector-borne diseases and pests (including impacts to agriculture)
- Altered timing of animal and plant lifecycles (phenology)
- Disruption of biotic interactions
- Changes in physiological performance, including reproductive success and survival of plants and animals
- Increase in invasive species
- Altered migration patterns of fishes, aquatic-breeding amphibians, birds, and mammals
- Changes in food (forage) base
- Changes in habitat, vegetation structure, and plant and animal communities

These changes have significant implications for water quality, water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the State. Several guidance documents have been drafted or have been published to discuss strategies to protect resources from climate change in California, such as the 2009 California Climate Adaptation Strategy (CNRA, 2009).

25.5.1.4 Climate Change and Sea Level Rise Effects on California's Water Resources

Although measured effects of climate change are occurring, significant uncertainty remains about the specific magnitude and in some cases even the direction of changes expected in the future. Temperature, precipitation, and sea level are all expected to change and will affect California's water resources in measureable ways.

Numerous studies and publications have noted the importance of considering climate change in water resources planning. The California Water Plan update 2009 states, "planning for and adapting to [climate] changes … will be among the most significant challenges facing water and flood managers this century" (DWR, 2009). Both DWR and Reclamation have noted the need to consider climate change effects in water resources planning studies. For the purposes of this Draft EIR/EIS and the companion Draft Feasibility Report, the potential effects of climate change on California's water resources, as well as on the proposed Project alternatives, are considered.

25.5.1.5 Water Management and Climate

Water management includes the development and fulfillment of operating schemes on a variety of time scales from days to decades (Reclamation, 2011a). Within water management planning, climate characterization informs estimations of future water supplies, future water demands, and boundaries of system operation. Climate information influences evaluation of resource management strategies through assumptions or characterization of future potential temperature, precipitation, and runoff conditions among other weather information. Water supply estimates are developed by making determinations of what Wet, Dry, and Normal periods may be like in the future and include the potential for hydrologic extremes that can create flood risks and droughts. Water demand estimates are developed across water management system uses, which include both the natural and the socioeconomic systems, including agriculture, municipal and industrial, environmental, and hydroelectric power generation.

25.5.1.6 Water Management, Climate Change Effects, and Associated Challenges

There are climate change effects and challenges that are especially relevant to water resources. These effects and challenges are described below as background to the climate change sensitivity analysis.

Reclamation Literature Synthesis

To support longer-term planning processes, Reclamation has created a region-specific literature synthesis of studies relating to climate change implications for Reclamation operations and activities in the 17 western states (Reclamation, 2011b). This report summarizes recent literature on the past and projected effects of climate change on hydrology and water resources, and summarizes implications for key resource areas featured in Reclamation planning processes. The Mid-Pacific Region section of the report describes scientific studies related to climate change for an area that includes most of California, as well as the Klamath River watershed that originates in southern Oregon and the Lahontan watershed that is mainly in Nevada. The Colorado River basin of California is not included within the region. Several observations from the Mid-Pacific Region literature synthesis are listed below by category:

Historical Climate and Hydrology

- Western United States spring temperatures increased 1 to 3°C (1.8 to 5.4°F) between the 1970s and late 1990s. Increasing winter temperature trends observed in central California averaged approximately 0.5°C (0.9°F) per decade from the late 1940s to the early 1990s (Dettinger and Cayan 1995).
- Increased winter precipitation trends are noted during 1950 to 1999 at many western United States sites, including several in California's Sierra Nevada; but a consistent region-wide trend is not apparent.
- Coincident with these trends, the western United States and Mid-Pacific Region also experienced a general decline in spring snowpack, reduced snowfall to winter precipitation ratios, and earlier snowmelt runoff from the late 1940s to early 2000s.
- On explaining historical trends in regional climate and hydrology, several studies indicate that most observed trends for snow water equivalent (SWE), soil moisture, and runoff in the western United States are the result of increasing temperatures rather than precipitation effects (Lettenmaier et al., 2008).
- In many Mid-Pacific Region headwater basins, even with precipitation being equal, warmer temperatures in these watersheds cause reduced snowpack development during winter, more runoff during the winter season, and earlier spring peak flows associated with an earlier snowmelt.

Projected Future Climate and Hydrology

- Several studies have been conducted to relate potential future climate scenarios to Mid-Pacific Region runoff and water resources management impacts. In general, there is greater agreement reported between model projections of temperature and, thus, higher confidence in future temperature change relative to precipitation change.
- Several studies have examined potential hydrologic impacts associated with projected climate change. Analyses show that runoff could occur as much as two months earlier than what currently occurs, and

earlier runoff timing of at least 15 days in early-, middle-, and late-season flow is projected for almost all mountainous areas where runoff is snowmelt driven.

- Future impacts on hydrology have been shown to have implications for water resources management. Management of western United States reservoir systems is very likely to become more challenging as net annual runoff decreases and interannual patterns continue to change as the result of climate change.
- Recently developed climate projection scenarios (Moser et al., 2009) suggest that current climate projections for California would lead to decreased snowpack by the end of the century (20 to 40 percent, depending on emissions scenarios), increased risk of winter flooding, earlier timing of meltwater runoff and greater vulnerability to summer shortfalls, decreased hydropower generation (under dry warming), and decreased quality of winter recreation.

Studies of Impacts on Natural Resources

- Biodiversity may be affected by climate change (Janetos et al., 2008), and many studies have been published about the impacts of climate change on individual species and ecosystems. Climate change also has affected forest insect species range and abundance through changes in insect survival rates, increases in life cycle development rates, facilitation of range expansion, and the effect on host plant capacity to resist attack (Ryan et al., 2008). Predicted future impacts are primarily associated with projected increases in air and water temperatures and are expected to result in poleward shifts in the range of many species, adjustment of migratory species arrival and departure, amphibian population declines, and effects on pests and pathogens in ecosystems.
- Studies of the effects of climate change on agriculture and water resources focus on the many issues associated with future agricultural water demands; only a few studies have attempted to predict climate change impacts on irrigation demands. Limited study findings suggest significant irrigation requirement increases for corn and alfalfa, demand decreases due to crop failures caused by pests and disease exacerbated by climate change, and demand increases if growing seasons become longer or farming practices are adapted by planting more crop cycles per growing season.
- Increased air temperatures could increase aquatic temperatures and affect fisheries habitat. In general, studies of climate change impacts on freshwater ecosystems are more straightforward with streams and rivers, which are typically well mixed and track air temperature closely, as opposed to lakes and reservoirs, where thermal stratification and depth affect habitat (Allan et al., 2005).
- Warmer water temperatures also could exacerbate invasive species issues (e.g., quagga mussel reproduction cycles would respond favorably to warmer water temperatures); moreover, climate change could decrease the effectiveness of chemical or biological agents used to control invasive species (Hellmann et al., 2008). Warmer water temperatures also could facilitate the growth of algae, which could result in eutrophic conditions in lakes, declines in water quality (Lettenmaier et al., 2008), and changes in species composition.
- Another potential effect of climate change impacts on ecosystems and watershed hydrology involves changes in vegetation disturbances due to wildfires and forest dieback. In the western United States, increases in spring-summer temperatures lead to reduced snow melt, soil moisture, and fuel moisture conditions. These reductions, in turn, affect wildland fire activity.

Studies on Historical Sea Level Trends and Projected Sea Level Rise Under Climate Change

- Sea level conditions at San Francisco Bay's Golden Gate Bridge (Golden Gate) affect water level and salinity conditions in the upstream Delta. Throughout the 20th century, sea levels near San Francisco Bay increased by more than 0.21 meters (8 inches) (Anderson et al., 2006).Veermeer and Rahmstorf, (2009) present a dual component relationship with short- and long-term sea level response components to temperature change. Based on this work and applying the IPCC emission scenarios, by 2100, sea levels are predicted to be 1 to 2 meters (39.4 to 78.7 inches) higher than at present.

Climate Change Challenges

DWR has noted similar anticipated effects and associated challenges for California's water resources. The trends of the last century – especially the increases in hydrological variability – will likely intensify this century, and abrupt changes in climate could also occur (DWR, 2008). DWR's list of climate change challenges includes the following:

- **Loss of Natural Snowpack Storage**: One of the most critical impacts for California water management may be the projected reduction in the Sierra Nevada snowpack – California's largest surface "reservoir." Snowmelt currently provides an annual average of 15 million acre-feet of water, slowly released between April and July each year. Much of the State's water infrastructure was designed to capture the slow spring runoff and deliver it during the drier summer and fall months. Based upon historical data and modeling, DWR projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050.

- **Drought:** Warming temperatures, combined with changes in rainfall and runoff patterns will exacerbate the frequency and intensity of droughts. Regions that rely heavily upon surface water (rivers, streams, and lakes) could be particularly affected as runoff becomes more variable, and more demand is placed on groundwater. Along with drier soils, forests will experience more frequent and intense fires, resulting in subsequent changes in vegetation, and eventually a reduction in the water supply and storage capacity benefits of a healthy forest. Climate change will also affect water demand. Warmer temperatures will likely increase evapotranspiration rates and extend growing seasons, thereby increasing the amount of water that is needed for the irrigation of many crops, urban landscaping and environmental water needs. Other challenge factors related to drought include stress upon the State's forests, environment, non-irrigated agriculture and rangeland, and recreation.

- **Floods:** The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more of the Sierra Nevada watersheds to contribute to peak storm runoff. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Other related challenge factors include erosion, habitat, and water quality. Flood planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypasses and levees, as well as the design of local sewers and storm drains.

- **Water Quality:** Changes in the timing of river flows and warming atmospheric temperatures may affect water quality and water uses in many different ways. Among other water quality effects, warmer water will distress many fish species and could require additional cold water reservoir releases.

- **Sea Level Rise:** Sea levels are rising, and it is generally accepted that this trend will continue and likely accelerate. However, the exact rate of rise is unknown, due to ongoing scientific uncertainty about the melting of ice sheets on western Antarctica and Greenland and the potential for abrupt changes in ocean conditions.

The Delta (i.e., channels and waterways) serves as an integral component of California's water supply system. Much of the Delta is located at or near sea level and is influenced by tidal conditions. Delta water supplies and aquatic habitat will be affected by sea level rise due to saltwater intrusion. An increase in the penetration of seawater into the Delta will further degrade drinking and agricultural water quality and alter ecosystem conditions. More freshwater releases from upstream reservoirs will be required to maintain salinity levels for municipal, industrial, agricultural, and existing ecological water uses.

- **Hydroelectric Generation:** Climate change will reduce the reliability of California's hydroelectricity operations, which, according to the California Climate Action Registry and the California Air Resources Board, is the State's largest source of greenhouse gas emissions-free energy. Changes in the timing of inflows to reservoirs may exceed generation capacity, forcing water releases over spillways and resulting in lost opportunities to generate hydropower. Higher snow elevations, decreased snowpack, and earlier snowmelt may result in less water available for clean power generation during hot summer months, when energy demand is highest. The impact is compounded overall by anticipated increased energy consumption due to higher temperatures and greater water demands in summer when less water is available.

25.5.2 Environmental Impacts/Environmental Consequences

25.5.2.1 Climate Change and Sea Level Rise Sensitivity Analysis

Climate Change Effects on the Proposed Project

A detailed and comprehensive analysis of the effects of the proposed Project alternatives, assuming current climate and variability, is presented in each of the resource chapters of this document (i.e., Chapters 6 though 31). The sensitivity analysis of potential climate change effects on the proposed Project alternatives is described below. The climate change sensitivity analysis and results are described in greater detail in Appendix 25B. The sensitivity analysis uses a methodology that was selected because of its ability to depict both a trend and a potential range of effects.

This sensitivity analysis attempts to help answer the following questions:

- How would climate change and sea level rise effects (especially modified runoff and hydrology) influence diversion to proposed Project storage?
- How would climate change and sea level rise affect the proposed Project's ability to provide system flexibility (i.e., water in storage)?
- How would climate change and sea level rise affect the ability of the proposed Project to provide primary objective benefits, including water supply reliability, fish survival, Delta water quality, and flexible hydropower generation?
- How would climate change and sea level rise affect the environmental effects of the proposed Project?

The NODOS climate change and sea level rise sensitivity analysis has been prepared as a tool for planners, resources specialists, stakeholders, and the public to consider the influence of climate change and sea level rise on the performance of the proposed Project and on the potential effects of the proposed

Project. The sensitivity analysis provides a context for consideration of uncertainty and anticipated trends due to climate change throughout the planning horizon for the proposed Project. A comparison of the No Project/No Action Alternative, with and without climate change and sea level rise, is intended to help the reader understand the trend and potential range of effects upon California's major water systems associated with climate change and sea level rise. In addition, the sensitivity analysis is intended to help the reader understand how the trend and range of potential climate change and sea level rise effects will impact the performance of the proposed Project action alternatives.

Provided below is a description of the methodology used for the sensitivity analysis and some of the results and findings of the sensitivity analysis.

Approach and Assumptions

NODOS Project Detailed Evaluation Scenarios

In the detailed evaluation of the proposed Project alternatives in the DEIR/EIS and Draft Feasibility Report, the SWP and CVP operations model (CALSIM II) was used to simulate the following scenarios, assuming the current climate and sea level condition:

- Existing Conditions
- No Project/No Action Alternative
- **Alternative A:** includes a 1.27-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing Tehama-Colusa (T-C) and GCID canals and a new Delevan Pipeline (2,000 cfs diversion/1,500-cfs release)
- **Alternative B:** includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals, and a new release-only Delevan Pipeline (1,500-cfs release)
- **Alternative C:** includes a 1.81-MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing T-C and GCID canals and a new Delevan Pipeline (2,000-cfs diversion/1,500-cfs release)

The detailed evaluation of the proposed Project alternatives also used several hydrologic, operations, water quality, fisheries, riverine geomorphic and sediment, power, and economics models. The detailed evaluation involved the simulation and analysis of more than 100 parameters describing water flow, storage, diversion, temperature, salinity, fish population and mortality, power generation and use, and various revenues and costs associated with the water system included in the three study areas. A more detailed description of the suite of models that were used is presented in Appendix 6B.

For the climate change and sea level rise sensitivity analysis, the No Project/No Action Alternative and Alternatives A, B, and C were simulated for four additional climate and sea level scenarios. However, the modeling for the sensitivity analysis included only the CALSIM II operations simulation model. The CALSIM II model description, assumptions, and results are included in Appendix 6A and Appendix 6C.

Climate and Sea Level Scenarios

The climate and sea level scenarios used in this sensitivity analysis were previously developed for the Bay Delta Conservation Plan[10] (BDCP) Effects Analysis and DEIR/S[11] and documented in the BDCP Effects Analysis Appendix 5.A.2 (DWR, 2012b) and the BDCP DEIR/S Appendix 5A (DWR, 2012c).The DWR modeling team developed climate and sea level scenarios for evaluation of the BDCP alternatives. The Lead Agencies for the BDCP collaborated on the methodology and approved the selection and use of scenarios for the Effects Analysis and DEIR/S for that program. The BDCP appendix describes the methodology and selection of the climate and sea level scenarios and the development of the inputs and modifications for the CALSIM II model. This methodology separates potential climate futures into quadrants (Q1to Q4 and a central or median "quadrant" called Q5), where temperature increase and precipitation varies. A more detailed discussion of the quadrants is found below in the Climate Scenarios discussion. The concept of the quadrants is illustrated in Figure 25-5, which shows an example of using the quadrants to describe climate in the Feather River basin.

For the NODOS Project sensitivity analysis, four climate and sea level scenarios, in addition to the current climate and sea level scenario (Current), were selected for comparative analyses:

- The Early Long Term (ELT) scenario assuming the median (Q5) of an ensemble of Global Climate Model (GCM) projections at a point in time 15 years into the future (from the baseline date of 2009 for BDCP and also referred to as approximately 2025) and a sea level rise of 15 cm (6 inches). The ELT Q5 scenario is referred to later in this section as one point in the climate change trend.
- The Late Long Term (LLT) Q5 scenario assuming the median of an ensemble of GCM projections at a point in time 50 years into the future (~2060) and a sea level rise of 45 cm (18 inches). The LLT Q5 scenario is also referred to later in this section as one point in the climate change trend.
- The LLT Q2 scenario assuming the "drier, more warming" lower bound (Q2) of an ensemble of GCM projections at a point in time 50 years into the future (~2060) and a sea level rise of 45 cm (18 inches). The LLT Q2 scenario is referred to later in this section as the Lower potential range of effect associated with climate change.
- The LLT Q4 scenario assuming the "wetter, less warming" upper bound (Q4) of an ensemble of GCM projections at a point in time 50 years into the future (~2060) and a sea level rise of 45 cm (18 inches). The LLT Q4 scenario is referred to later in this section as the Upper potential range of effect associated with climate change.

An example parameter showing the relationship between the Current, ELT Q5, LLT Q5, LLT Q2, and LLT Q4 scenarios is shown in Figure 25-6. The figure shows the CALSIM II model results for the No Project/No Action Alternative for Shasta Lake end-of-September storage conditions, and how these conditions are affected by climate change. This graphic indicates, in part, an anticipated trend as well as potential range of effect of climate change for one parameter (Shasta Lake end-of-September storage). The trend of climate change effect is indicated by the blue line that is described by the Current, ELT Q5,

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[10] As of 2013, the Bay Delta Conservation Plan (BDCP) is being prepared by a group of local water agencies, environmental and conservation organizations, State and federal agencies, and other interest groups. DWR and Reclamation are the State and federal lead agencies, respectively.

11 The BDCP is being developed in compliance with the Federal Endangered Species Act and the California Natural Communities Conservation Planning Act. When complete, the BDCP will provide the basis for the issuance of endangered species permits for the operation of the State and federal water projects. The plan would be implemented over the next 50 years. The heart of the BDCP is a long-term conservation strategy that sets forth actions needed for a healthy Sacramento-San Joaquin Delta.

and LLT Q5 scenarios. The nomenclature "trend" is used because Q5 is the median climate change projection at 15 and 50 years. Thus, Q5 represents a central tendency of potential climate futures. The potential range of effects associated with climate change is described by the Q2 and Q4 climate change projections. As might be anticipated, for Shasta Lake end-of-September storage, LLT Q5 falls between the range Q2 (Lower) and Q4 (Upper). This result, where LLT Q5 falls between LLT Q2 and LLT Q4, is often, but not always, true.

Current, ELT Q5, and LLT Q5 Trend

The trend in climate and sea level conditions over the next 50 years is shown by the results of the three point trend of Current, ELT Q5, and LLT Q5 in climate and sea level conditions. Because this chapter seeks to describe a trend in the performance and impacts of the proposed Project alternatives under potential future climate and sea level conditions, comparisons were made between the proposed Project action alternatives (Alternative C in this chapter, as described below, and Alternatives A, B, and C in Appendix 25B) and the No Project/No Action Alternative with the same climate and sea level assumptions. The trend is described by the following data points for a given metric:

- NODOS action alternative (Current) minus No Project/No Action Alternative (Current)
- NODOS action alternative at ELT Q5 minus No Project/No Action Alternative at ELT Q5
- NODOS action alternative at LLT Q5 minus No Project/No Action Alternative at LLT Q5

In this section, the analysis of alternatives without climate change is referred to as Current because these analyses use current or historic hydrology and sea level conditions. These analyses, comparing proposed Project action alternatives to the No Project/No Action Alternative, with consistent climate and sea level scenarios, highlights potential future conditions that would exist with implementation of each of the proposed alternatives if climate changed consistent with the scenarios described. The use of three different climate scenarios (Current, ELT Q5, and LLT Q5) represent a central estimate of climate and sea level rise conditions that would persist at each time period, referred to as the climate change and sea level rise trend.

LLT Q2 and LLT Q4 Uncertainty Range

Because this chapter seeks to also describe a range in the performance and impacts of the proposed Project alternatives under a potential range of projected future climate and sea level conditions, comparisons were made between the proposed Project action alternatives (Alternative C in this chapter, as described below, and Alternatives A, B, and C in Appendix 25B) and the No Project/No Action Alternative with the same climate and sea level assumptions. The range is described by the following data points for a given metric:

- NODOS action alternative at LLT Q2 minus No Project/No Action Alternative at LLT Q2
- NODOS action alternative at LLT Q4 minus No Project/No Action Alternative at LLT Q4

Selected model inputs and results for the No Project/No Action Alternative are compiled in Appendix 25B. This compilation is helpful to understand the magnitude of potential changes associated exclusively with climate change and sea level rise without proposed Project implementation.

Model results for all proposed Project alternatives are compiled in Appendix 25B. This compilation is helpful to understand the magnitude of potential changes in the performance and effects of the proposed Project alternatives due to climate change and sea level rise.

The results of the sensitivity analysis are not intended to be used for detailed evaluation of proposed Project alternatives, and are subject to some limitations.

Use of Analytical Tools

The analytical process for incorporating climate and sea level scenarios into the CALSIM II simulation model includes the use of several sequenced analytical tools. These tools and the analytical process are shown conceptually in Figure 25-7. This process includes modified hydrologic inputs (inflow time-series) and modified flow-salinity relationships for Delta salinity compliance modeling.

Climate Scenarios

For the NODOS Project sensitivity analysis, ELT and LLT scenario representations (called scenarios) were selected. These scenarios were developed from a larger set of projections and were statistically derived from those projections. The ELT scenario considers climate conditions (temperature and precipitation) for a period of 30 years centered on analysis year 2025 (years 2011 to 2040) and projected sea level conditions at year 2025. Likewise, the LLT scenario considers climate conditions for a period of 30 years centered on analysis year 2060 (years 2046 to 2075) and projected sea level conditions at year 2060.

Consistent with the projections used in the IPCC Fourth Assessment Report (IPCC, 2007a), a collection of 112 future climate scenario projections (i.e., Global Climate Models) based on multiple models and multiple emission scenarios was used in the development of the ELT and LLT scenarios. The 112 future climate projections and the resultant five ensembles (Q1 through Q5) are graphically depicted in an example in Figure 25-5 using downscaled climate projections for a region in the Feather River watershed.

Based on the median (50th percentile) change of both annual temperature and annual precipitation (dashed blue lines in Figure 25-5), the state of change for a 30-year climate period can be broken into quadrants (or regions) representing Q1: drier, less warming; Q2: drier, more warming; Q3: wetter, more warming; and Q4: wetter, less warming. In addition, a fifth region Q5 can be described using samples from inner-quartiles (25th to 75th percentile) of the collection. In each of the five regions, the ensemble of climate change projections, made up of those contained within the region bounds, is identified. The Q5 ensemble was derived from the central trending climate projections and thus favors the consensus of the collection. Additional technical information related to the climate change scenarios used for the NODOS Project sensitivity analysis can be found in Appendix 25B.

Using ensembles, one ELT scenario and three LLT scenarios were selected to describe the sensitivity of California’s water resources systems and the sensitivity of the proposed Project alternatives. For evaluating proposed Project alternatives along the trend in climate and sea level conditions over the next 50 years, the ELT and LLT Q5 scenarios were selected. For evaluating proposed Project alternatives throughout the potential range of climate and sea level conditions at 50 years, near the mid-point of the proposed Project planning period, the LLT Q2 (drier, more warming) and Q4 (wetter, less warming) scenarios were selected because these scenarios would likely capture the bounding conditions of climate change and sea level rise relevant to the proposed Project alternatives being considered.

For a climate scenario, the statistics of the appropriate ensemble of downscaled climate change projections were used to develop modified hydrology for the 22 tributary watersheds of the Central Valley. The downscaled climate projections were used to create modified temperature and precipitation inputs for the Variable Infiltration Capacity (VIC) hydrology model. The VIC model simulates hydrologic processes on the one-eighth degree scale spatial resolution to produce statistics of watershed runoff. The changes in reservoir inflows and downstream accretions/depletions were translated into modified input time series for the CALSIM II model.

Sea Level Scenarios

Sea level projections were based on an existing empirical method (Rahmstorf, 2007). This method better reproduces historical sea levels and generally produces larger estimates of sea level rise than those indicated by the IPCC (IPCC, 2007a). When evaluating all projections of global air temperature, this method projects a mid-range sea level rise of 70 to 100 cm (28 to 40 inches) by the end of the century, and when factoring the full range of uncertainty, the projected rise is 50 to 140 cm (20 to 55 inches). Using this method, the projected sea level rise at year 2025 would be approximately 12 to18 cm (5 to 7 inches), and at year 2060 would be approximately 30 to 60 cm (12 to 24 inches). These sea level rise estimates are also consistent with those outlined in the recent USACE guidance circular for incorporating sea-level changes in civil works programs (USACE, 2009). For the proposed Project sensitivity analysis, a sea level rise of 15 cm (6 inches) was assumed for the ELT scenario and a sea level rise of 45 cm (18 inches) was assumed for all LLT scenarios.

Limitations of Sensitivity Analysis

There are limitations associated with the application and use of the NODOS Project climate change and sea level rise sensitivity analysis. The limitations are summarized below and described in greater detail in Appendix 25B.

The NODOS Project sensitivity analysis is limited by uncertainty related to climate change and sea level rise modeling. There is uncertainty in each sequenced step depicted in Figure 25-7. There are also specific uncertainties related to how operations may need to be modified to adapt to climate change, especially to mitigate the frequency of dead storage conditions at reservoirs caused by climate change and sea level rise. In addition, proposed Project operations may need to be modified to adapt to climate change and sea level rise effects to maximize the effectiveness of the additional storage provided by potential proposed Project implementation. These latter two limitations are related to the adjustment of operations that occur over time. Operators have learned how to operate the system of reservoirs and delivery facilities effectively with historic and current climate. Operators, as well as modelers, understand and learn what works and what does not work for the current climate, system requirements, and commitments. Consequently, operations effectively become “tuned” to the current climate. As climate change effects intensify, modified operations, or refinements, will likely be necessary to meet the multiple objectives of the CVP, SWP, and Central Valley systems. Also, proposed Project operations have been refined for the current climate analysis associated with the detailed evaluation of reasonably foreseeable conditions described in the remainder of the DEIR/EIS. As described below, information available as a result of the detailed and iterative modeling of the current climate was helpful in developing operations that minimize impacts and maximize benefits associated with adding offstream surface storage north of the Delta. In contrast, the refining of proposed Project operations for the ELT Q5, LLT Q5, LLT Q2, and LLT Q4 scenarios was less precise and of less quality because detailed modeling was not used.

NODOS Project Assumptions and Operating Criteria

As described above, the CALSIM II simulations of the proposed Project action alternatives were developed and refined to the conditions of the existing water resources system and current climate. This process was iterative using the full suite of hydrologic, operations, water quality, fisheries, power, and economics models applied to the detailed evaluation of proposed Project action alternatives. A description of the suite of models is provided in Appendix 6B. This refinement process was performed for each individual operational element that depends on the proposed Sites Reservoir, and included definition of metrics, assessment of beneficiary performance, modification of assumptions and inputs to improve performance, and prioritization of beneficiary performance.

However, only the CALSIM II model was used for the sensitivity analysis; therefore, much of the information required to provide feedback to the NODOS Project operating criteria was not available. There was limited consideration of how potential benefits may have been impacted due to climate change and sea level rise; therefore, additional refinements of NODOS Project operating criteria under climate change and sea level rise conditions were limited as well.

Following the initial set of sensitivity analyses simulations, with only the CALSIM II model results available, it was evident that some significant changes would occur in the performance of the proposed Project action alternatives. Based upon these observed changes, a minor alternative refinement was made for the NODOS climate change sensitivity analysis. An increased need for improved storage and maintenance of coldwater pools under ELT Q5 and substantially more under LLT Q2 and Q5 climate and sea level conditions was identified. A decision was made to limit other operations that put the higher priority Ecosystem Enhancement Storage Account (EESA) actions related to coldwater pools at risk. These variations in the NODOS Project operating criteria assumed throughout the climate and sea level rise scenarios are shown in Appendix 25B, Table 25-2. This limited refinement is reflected in the action alternative results discussed below.

Limitations Considerations

The results of the sensitivity analysis should be considered as a tool to provide a comparative understanding of the trend of climate change effects and the relative performance of NODOS Project alternatives with climate change. Any conclusions derived from the sensitivity analysis results should be considered to be qualitative and as an indicator of potential changes related to climate change and sea level rise. Consequently, the results of this analysis should not be used independently for decision making purposes, but rather as supplemental to the detailed evaluations in the Draft Feasibility Report and DEIR/EIS.

In the CALSIM II model, dead pool conditions are assumed at 240 TAF for Trinity Lake, 550 TAF for Shasta Lake, 30 TAF for Lake Oroville, and 90 TAF for Folsom Lake. These are extreme operational limits and are well below the range of reasonable reservoir operations. In real-time reservoir operations, operators and regulators would significantly modify operations to avoid a dead pool condition. As storage in a reservoir approaches dead pool, operators and regulators would initiate an emergency consultation and agree on a modified operational strategy to meet various commitments in a more limited way. This type of modified operation is not included in the CALSIM II operations simulation since the circumstances of an emergency consultation can vary in significant ways. While CALSIM II results are not considered to be predictive generally, the limitations regarding results that indicate dead pool conditions at a reservoir are especially important to understand. Dead pool occurrences in this document should be understood to mean that a reservoir, and more broadly a system of reservoirs, would likely be operating in an emergency condition. The ability to meet one or more system objectives will be impaired and normal operations cannot be sustained.

Analysis Results

The results of the NODOS Project climate change and sea level rise sensitivity analysis include both an effect trend as well as a potential range of effect related to climate change and sea level rise.

Model inputs and results for the No Project/No Action Alternative and for all proposed Project action alternatives are compiled in Appendix 25B. Some additional results and findings are presented below.

No Project/No Action Alternative Findings

The No Project/No Action Alternative findings are based on a sensitivity analysis of changes in the SWP/CVP/Delta system that are expected to occur over the next 50 years as a result of a changing climate only (i.e., without implementation of a proposed Project).

The following observations related to the effect of climate change and sea level rise are primarily based on the Current, ELT Q5, and LLT Q5 scenario trend differences. Generally, these observations are consistent with water management and climate change effects expected and described previously. They are based on the results of VIC simulations of the climate and sea level scenarios selected and the subsequent results of CALSIM II simulations of the No Project/No Action Alternative:

- Increased runoff in late winter/early spring and reduced runoff in late spring and summer
- Increased salinity in the western and central Delta
- Reduced river and Delta inflow due to decreases in runoff, specifically in summer months and Dry and Critically Dry year conditions
- Increased Delta outflow requirements in Dry and Critically Dry year conditions due to increased salinity conditions
- Increased use of reservoir storage to maintain flow, temperature, and Delta salinity requirements
- Decreased use of reservoir storage to meet demands for agricultural and urban water use
- Decreased reservoir storage conditions in summer and fall and uncertain changes in frequency of annual refilling of existing reservoirs
- Increased variability and overall decreased water allocations for SWP and CVP Delta exports and other diversions
- Increased occurrence of dead pool[12] storage at reservoirs and potential operational interruptions

The CALSIM II results indicate changes in flows and storage conditions from the Current, ELT Q5, and LLT Q5 scenario trend, and to some extent the potential range of LLT Q2 and Q4 scenarios, such that the following is expected (but has not been confirmed with detailed modeling):

- Increased water temperatures in reservoirs and rivers
- Reduced suitable riverine habitat for coldwater fish due to warmer water temperatures throughout all seasons and lower flows during late spring and summer
- Modified peak and natural pulse flow conditions

Of particular importance is the finding of increased salinity in the western and central Delta. This salinity effect would be caused primarily by sea level rise, where sea water from San Francisco Bay would intrude into the Delta. The observed trend and range of effects to the X2 position is almost exclusively eastward,

[12] For the purposes of this analysis, "dead pool" occurs when the operating storage in a reservoir equals zero. For most reservoirs, some water would remain in storage as described previously, but it could not be released for any downstream purpose because the water is at or below the lowest intake level.

indicating increased salinity. As shown in Table 25B-20 of Appendix 25B, X2 movement associated with climate change ranges between -0.3 km (0 percent) in October to 3.6 km (5 percent) in May. All months except October show positive or eastward movement, indicating diminished water quality. This result is indicated by comparing average X2 position associated with the No Project/No Action Alternative using current climate and the LLT Q5 trend. Consequently, Delta outflow would need to be increased because more water would be required to meet water quality requirements. The result would be a reduced amount of water available in storage to manage the system for all other uses. Consequently, storage in the major CVP and SWP reservoirs north of the Delta (including Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake) would decrease, and exports from the Delta would be reduced. These results are consistent with previous studies finding that CVP and SWP operations would be most affected by annual runoff through mid-century, and then sea level rise becomes the most critical factor by the end of the century (Wang et al., 2011).

In addition, the climate change sensitivity analysis findings indicate that California's major water systems would become increasingly vulnerable to operational interruptions. For example, the occurrence of dead pool conditions at system reservoirs would increase with climate change. This type of vulnerability to operational interruptions is discussed in greater detail below and in Appendix 25B.

Proposed Project Action Alternatives Findings

Model results for all alternatives are compiled in Appendix 25B. The results in the appendix are shown in tables as seasonal, annual, and selected monthly values; differences with the Current climate and sea level scenario; and differences with the No Project/No Action Alternative for Current, ELT Q5, and LLT Q5 climate and sea level scenarios. The results are presented for long-term and upper, above median, below median, and lower quartile range averages. The results are also shown graphically as seasonal, annual, and selected monthly values ranked and charted against probability of exceedance; exceedance figures show the entire range of probability.

The following conclusions were made based on the comparison of the results of the CALSIM II simulations for the proposed Project action alternatives with the No Project/No Action Alternative evaluated for Current, ELT, and all LLT climate and sea level scenarios:

- The ability to divert water into proposed Project storage would be the same or slightly increased due to changes in the timing of snowmelt runoff and the continued opportunity to use the intakes under a wide range of climate scenarios.
- The proposed Project action alternatives could provide a similar array of potential benefits under a range of climate and sea level scenarios, including the primary objectives of (1) increasing survival of anadromous fish populations, (2) improving water supply reliability for agricultural, urban, and environmental uses, and (3) improving drinking and environmental water quality in the Delta.
- The proposed Project action alternatives would improve system storage conditions and could mitigate some of the effects of climate change and sea level rise specifically related to impacts on storage operations and associated increase in vulnerability of the water resources system to operational interruption.

The sensitivity analysis did not include the full suite of models that are listed in Appendix 6B, such as daily operations, temperature, fisheries, and economics modeling. However, the CALSIM II results do indicate changes in flows and storage conditions between the proposed Project action alternatives and the

No Project/No Action Alternative throughout the Current, ELT, and all LLT scenarios such that the following is expected (but has not been confirmed with modeling):

- The proposed Project with climate change would likely improve the temperature regime of the upper Sacramento River for salmonids, when compared to the No Project/No Action Alternative with climate change.
- As observed, the No Project/No Action Alternative performance of the CVP and SWP systems (for the purposes of water supply, water quality maintenance, and maintenance of aquatic habitats) would decrease with climate change and sea level rise because the systems would have less water to manage. Because the reliability of the SWP and CVP would be diminished with climate change, the economic value of additional water would likely be enhanced. The total value of proposed Project benefits may be greater as well.

Specific Effects of Climate Change and the Proposed Project

The analysis and discussion of effects to proposed Project action alternatives associated with climate change and sea level rise included both the trend (which includes the Current, ELT Q5, and LLT Q5 scenarios) and the range of potential effects (which includes LLT Q2 and LLT Q4 scenarios). The analysis and discussion focused on the sensitivity effects upon Alternative C. As shown in the comprehensive presentation of effects based upon detailed modeling, Alternative C consistently has the greatest effect upon resources, when compared to the No Project/No Action Alternative. Consequently, Alternative C likely reflects the greatest effect associated with climate change and sea level rise. The following observations were made based upon analyses and review of the sensitivity analysis results. A change in the trend of a metric of greater than five percent was considered to be a sensitive response to that metric. A change of less than five percent was considered to be minimally sensitive. Where appropriate, the cases where results support the anticipated effects described in the preliminary sections are identified.

1. Diversion to proposed Project storage for improved flexibility and benefits appears resilient to climate change and sea level rise effects. Diversion to proposed Project storage would be minimally sensitive to climate change and sea level rise, as shown in Figure 25-8. The trend in diversion to proposed Project storage indicates that there would be a reduction of less than one percent in the ELT Q5 scenario, and increases in diversion for all LLT scenarios. The observed LLT Q5 trend of diversion to proposed Project storage indicates an increase of 4.4 percent, when compared to the Current scenario. The increase in diversion to fill the proposed Sites Reservoir under all LLT climate and sea level scenarios demonstrates the resilience of the proposed Project in capturing excess flows for later use. This finding is consistent with and supported by the finding of increased runoff in late winter/early spring due to increased temperature effects on the timing of snowmelt runoff in the ELT and LLT scenarios.

   The proposed Project would rely on water from a combination of sources, including the Sacramento River that flows into and through Shasta Lake, the Trinity River, and the tributaries between Shasta Lake and the proposed Delevan Pipeline. The result described above associated with proposed Project diversion capability indicates more specifically the resilience of the source waters for the proposed Project as their runoff pattern is modified by climate change and sea level rise. Meanwhile, a downward trend in north-of-the-Delta storage (at Trinity, Shasta, Oroville, and Folsom) was observed in the No Project/No Action Alternative and all proposed Project action alternative scenarios for the ELT Q5 and LLT Q5 climate and sea level scenarios. The rate of decline in storage conditions would be slowed by the addition of the proposed Sites Reservoir to the water system. The expected increase of diversion to fill Sites Reservoir, for proposed Project action alternatives under all climate and sea level scenarios, coupled with the observed decrease in Sites Reservoir storage conditions relative to the Current scenario indicates that Sites Reservoir would fill and release at higher rates, potentially producing greater levels of benefits as climate change and sea level rise worsen.

2. System flexibility improvements (previously identified as a system need), as measured by end-of-May additional water in storage, would be minimally sensitive to climate change and sea level rise. Water in storage in May was shown because it represents the quantity of water available for system uses by water managers and operators as they enter the high water use season (for water supply, water quality maintenance in the Delta, and upstream habitat requirements). The trend of average additional water in storage in May, as shown in Figure 25-9 would be reduced by 0.25 percent for the ELT Q5 scenario and by 4.1 percent for the LLT Q5 scenario. As climate change and sea level rise effects increase, the ability of the proposed Project to improve flexibility would be somewhat diminished. The potential range of effect would range from a 1.8 percent increase to a 9.0 percent decrease. The amount of additional water available in storage in Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and the proposed Sites Reservoir would improve water and fisheries managers' ability to respond to various uncertainties and challenges, including climate change and sea level rise.

   For the proposed Project action alternatives, Sites Reservoir storage conditions would decrease consistent with the trend observed in existing SWP and CVP storage across the ELT Q5 and LLT Q5 climate and sea level scenarios. These trends are similar; however, not as large as the trends seen for the No Project/No Action Alternative. The distinct difference in these trends in total storage between the proposed Project action alternatives and the No Project/No Action Alternative is that the No Project/No Action Alternative results show a substantial loss in systemwide storage due to climate change and sea level rise. The proposed Project action alternatives show improved storage, when compared to the No Project/No Action Alternative. As climate change and sea level rise effects increase, the gain in storage in comparison to the No Project/No Action Alternative (without climate change and sea level rise) would be lost. The results over the ELT Q5 and LLT Q5 trend show that the proposed Project action alternatives could mitigate the loss in storage associated with the ELT Q5 scenario and, depending on the alternative, much of the loss in storage associated with the LLT Q5 scenario. The proposed Project action alternatives could not mitigate for the loss in storage in the LLT Q2 scenario. Also, the ability of the proposed Project action alternatives to accomplish the proposed Project's primary objectives would depend primarily on the ability of the action alternative to store and manage additional flows not otherwise available in the No Project/No Action Alternative. Under all climate and sea level conditions, including Current, there would be improvements in operations of these reservoirs with the proposed Project action alternatives, when compared to the No Project/No Action Alternative under the same climate and sea level condition. It is assumed that reduction in these extreme operations (operating at dead pool conditions) would improve compliance with minimum flow criteria and Delta salinities standards, and would help to meet allocated diversion volumes and water rights priorities, as well as operating agreement requirements.

   Finally, system flexibility (water in storage) is an excellent indicator of the viability and sustainability of the SWP and CVP water management systems. The ability of the systems to accomplish most of their purposes, including water supply, instream flows, temperature and habitat maintenance, Delta water quality, hydropower generation, and recreation, depend upon water in storage. Therefore, it is likely that if water in storage is improved by implementation of the proposed Project, then the long-term viability and sustainability of California's water management system would be improved as well.

The ability of the proposed Project to provide benefits (i.e., meet Project objectives) is measured by metrics chosen to represent the three main proposed Project water benefits. These benefits are fish survival (indicated by the coldwater pools at existing reservoirs), water supply reliability (indicated by Delta deliveries to SWP and CVP contractors), and improved water quality (indicated by the X2 position). These metrics are described below in items 3 through 5.

3. Cold water pool improvements at the existing reservoirs, as indicated by additional end-of-September storage at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake, would be sensitive to climate change and sea level rise (Figure 25-10). The trend of Alternative C additional water in storage at existing reservoirs would be reduced by 13.2 percent and 16.8 percent for the ELT Q5 and LLT Q5 scenarios, respectively. The potential range of effect on the coldwater pool improvement does not contain the trend. For most metrics, Q5 falls within the Q2 to Q4 range. In this case, the coldwater pool improvement would be 3.2 percent to 41.0 percent for Q4 and Q2, respectively. For the primary Project objective of increasing survival of anadromous fish populations, the highest priority would be to maintain improved storage conditions through the Dry years and summer months (July through September season). The improvement in storage conditions during these periods would retain cooler water (i.e., a coldwater pool improvement) and allow for more water releases for improving temperature conditions in the river reaches downstream of these reservoirs. As indicated by the improvement in the beginning (end-of-May storage) and ending (end-of-September storage) of the coldwater pool maintenance period, there would be a potential improvement in temperature conditions downstream of Trinity Lake, Shasta Lake, Lake Oroville and Folsom Lake with the proposed Project action alternatives, when compared to the No Project/No Action Alternative under the same climate and sea level scenario. This was found to be the case under the Current scenario evaluated in the Draft Feasibility Report and in the detailed evaluation of the Draft EIR/EIS. Consistent with the intent of the proposed Project action alternatives operations, the most substantial relative improvement in storage would be at Shasta Lake.

   Habitat suitability for anadromous fish populations is dependent upon both temperature and flow conditions. The expected improvement in storage conditions during the Dry years and summer months (July through September season) for cooler water (i.e., a coldwater pool improvement) and more water with the proposed Project action alternatives would result in temperature and flow improvements through increases in reservoir releases during Dry years and summer months (July through September season). These results indicate that proposed Project action alternatives would continue to improve conditions for fish survival with climate change.

4. Water supply reliability improvements, as indicated by exports from the Banks and Tracy pumping plants, would be minimally sensitive to climate change and sea level rise (Figure 25-11). Between Current, ELT Q5, and LLT Q5 climate and sea level scenarios, for all proposed Project action alternatives, long-term average annual total exports from the Banks Pumping Plant and Jones Pumping Plant would increase, when compared to the No Project/No Action Alternative. There are variations in these changes across climate scenarios as the changing conditions for Delta exports vary. This variation was described for the No Project/No Action Alternative. The values vary more in the LLT Q2 and Q4 results. Across all climate and sea level scenarios, below median and Dry year (lower quartile) averages show additional exports are sustained in drier year types due to the proposed

Project action alternatives. The absolute and relative magnitude of improvement increasing as the effect of climate change and sea level rise increases.

The relative increase in annual total exports under below median and Dry year average conditions is an indicator of the economic impact of the primary Project objective of improving water supply reliability for urban uses. The economic value of a given increment of water for urban use would increase as the "without project supply condition" deteriorates with climate change and sea level rise. The results of the sensitivity analysis indicate that the increment of water provided by the proposed Project action alternatives could increase even as overall system supply decreases. The primary Project objective of water supply reliability also includes agricultural and environmental uses (such as the replacement of wildlife refuge water supplies). The economic value of each of these supplies would be increased by storing and exporting these supplies through the Delta and making them available to the south-of-the-Delta water resources system. The results of the absolute and relative trends, when compared to the No Project/No Action Alternative, for below median and Dry year pumping at Banks Pumping Plant and Jones Pumping Plant indicate that the proposed Project action alternatives would continue to perform well (i.e., reliability improvements are sustained when comparing without climate change against with climate change) for the primary Project objective of increasing water supply reliability and indicate a trend of increased economic value of the exports as climate change and sea level rise occurs.

5. Water quality improvements, as indicated by the X2 position during July through September, would be minimally sensitive to climate change and sea level rise (Figure 25-12). The sensitivity analysis indicates that the trend of the X2 position would diminish by 0.1 percent in the ELT Q5 scenario and increase by 0.1 percent in the LLT Q5 scenario, when compared to the Current scenario. Between Current, ELT Q5, and LLT Q5 climate and sea level scenarios, the X2 position (and Old River at Rock Slough salinity conditions) would be improved during April through December. An improvement is indicated by a westward movement (i.e., reduction) in the X2 position (distance from the Golden Gate Bridge in kilometers) or a reduction in electrical conductivity (EC). The No Project/No Action Alternative results indicate that the degree of impact to the X2 position would vary according to Delta outflow conditions, and that the X2 position would move further eastward (i.e., it would increase) under all climate and sea level scenarios, when compared to the Current scenario.

   The improvement shown in the ELT Q5 and LLT Q5 scenarios, when comparing the proposed Project action alternatives and the No Project/No Action Alternative at a specific climate and sea level condition, would result from the operation of the proposed Project for supplemental Delta outflows to improve water quality conditions for urban intakes and environmental benefit in the Delta. These releases would occur in the summer (July through September) and fall (October through December). The effectiveness of improving Delta water quality conditions with supplemental releases from the proposed Project would decrease with sea level rise. Water quality would still be improved with the proposed Project, but to a lesser degree. Under ELT Q5 and LLT Q4 scenario conditions, the releases would be as effective as, or more effective than, under the Current scenario; however, under LLT Q5 and LLT Q2, the effectiveness of releases would be further diminished. For this reason, the Ecosystem Enhancement Storage Account (EESA) Action 5 (Delta outflow for Delta Smelt Habitat Improvement) was removed from the climate change sensitivity analysis. This EESA water is instead used in this sensitivity analysis to further enhance the increase coldwater pool actions at the existing reservoirs. Consequently, the water quality improvement provided by the proposed Project is less than in the detailed analysis, which includes the ecosystem water quality action.

The results of the X2 position and the Old River at Rock Slough salinity results indicate that in summer and fall (July through December), there would be a potential benefit of operating the proposed Project action alternatives for the primary Project objective of improving drinking water quality and environmental water quality in the Delta. Water quality improvements would still be achievable even in climate change and sea level rise scenarios where the improvement would require relatively more water than in the Current scenario.

6. The sustainability of system reservoirs would be sensitive to climate change and sea level rise, as indicated by the trend increase of dead storage occurrences associated with the No Project/No Action Alternative. The proposed Project would have the ability to provide improved system sustainability, as indicated by reductions in occurrences of dead storage at system reservoirs; however, this ability would be sensitive to climate change and sea level rise. Dead storage occurrences would increase from 28 to 69 to 123 for the No Project/No Action Alternative under the Current, ELT Q5, and LLT Q5 scenarios, respectively. With Alternative C, the occurrences would be reduced to 9, 35, and 111, respectively. Both the No Project/No Action Alternative and Alternative C expected occurrences of dead storage are shown in Figure 25-13. The proposed Project effect of mitigating occurrences of dead storage would be reduced as the trend of climate change and sea level rise continues, with reductions of 67.8 percent, 49.3 percent, and 9.8 percent for the Current, ELT Q5, and LLT Q5 scenarios, respectively. The frequency of dead pool conditions would increase under ELT Q5 and LLT Q5 climate and sea level scenarios.

NODOS Effects with Climate Change and Sea Level Rise

The NODOS Project climate change and sea level rise sensitivity analysis compares some metrics associated with some environmental resources. As a sensitivity analysis, the evaluation is not as comprehensive or precise as the detailed evaluation of effects in the environmental resource chapters of this EIR/EIS (i.e., Chapters 6 through 31). The evaluations of proposed Project effects within the environmental resource chapters are based upon Current climate conditions.

The following discussion provides a general understanding of how environmental resources and effects associated with the proposed Project action alternatives may be altered with climate change. Each of the environmental resource categories are described with consideration of the anticipated general climate change effects to the resource, the potential for changed proposed Project effects with climate change, as compared to without climate change (i.e., as presented in the environmental resource chapters), and potential resiliency improvements that may be provided by proposed Project implementation. For this discussion, resilience for a resource is a potential improvement of the capacity for that resource to return to prior conditions after anticipated climate change and sea level rise effects.

Generally, the relative degree of environmental effects would be greater under the Current climate scenario because the SWP and CVP systems are already subject to significant environmental effects with the No Project/No Action Alternative in the climate change and sea level rise scenarios. If a significant effect were identified for the Current scenario, the effect would likely be relatively less significant in the sensitivity analysis scenario. As previously noted, effects to resources associated with the detailed evaluation and Current climate are evaluated using more comprehensive and detailed analysis and modeling. These more detailed evaluations and descriptions of proposed Project effects are found in the individual resources chapters. These more comprehensive analyses were not included as part of the climate change and sea level rise sensitivity analysis. Consequently, more precise determinations of effects associated with the sensitivity analysis are not available.

Surface Water Resources (Chapter 6)

Climate change and sea level rise are expected to affect surface water resources due to the anticipated increased air, water, and soil temperatures; altered runoff; increased frequency and severity of floods and droughts; and Delta salinity intrusion. Most of these effects were evaluated in the NODOS Project climate change sensitivity analysis in this chapter. The sensitivity analysis results indicate that most metrics of surface water resources, including reservoir storage, streamflow, and deliveries, would trend negatively as climate change and sea level rise effects increase in the future. However, with implementation of Alternatives A, B, and C, water supply reliability would be maintained or increased, when compared to the No Project/No Action Alternative. The NODOS Project formulations were developed to add resiliency to the CVP, SWP, and Central Valley water systems. As noted, these systems have an identified need for flexibility (i.e., water in storage) that would be demonstrably enhanced by implementation of the proposed Project. In addition, the proposed Project’s ability to meet objectives that require additional water, including fish survival, water supply reliability, water quality, and flexible generation hydropower, appears resilient to climate change and sea level rise effects. Having more water in storage, both in the proposed Sites Reservoir and in existing reservoirs, would allow water system operators and managers to more easily adapt to a number of future uncertainties, including climate change.

Surface Water Quality (Chapter 7)

Climate change and sea level rise are expected to affect surface water quality due to the anticipated increased water temperatures, altered runoff, increased frequency and severity of floods and droughts, and increased Delta salinity. As noted previously, salinity in the western and central Delta is expected to increase due to both sea level rise and changes in runoff, especially during summer/fall months and drier year type conditions. As in the detailed Current climate analysis comparison of proposed Project effects, the X2 position would generally increase during the winter/spring period when the proposed Project would divert, and the X2 position would improve (i.e., decrease) during summer/fall, reflecting the Delta water quality proposed Project objective improvements. According to the sensitivity analysis, changes to the X2 position with climate change would be similar to those with Current climate. Improvements to the X2 position supported by the proposed Project water quality objective operations would, however, become relatively less effective with climate change and sea level rise. As noted in the Surface Water Resources discussion presented above, the proposed Project action alternatives would be a helpful adaptive asset and provide resilience because water system operators and managers would have more water in storage to manage Delta water quality, among other proposed Project and existing system objectives.

Fluvial Geomorphology and Riparian Habitat (Chapter 8)

Climate change and sea level rise may change our rivers geomorphic characteristics and associated riparian habitat. Changes could occur as a result of the anticipated increased frequency and severity of high flow events and erosion, and changes in runoff timing. In addition, future reservoir operations would be maintained at relatively lower levels to respond to increased demand. These operations would allow a greater percentage of flood flows to be managed by existing reservoirs, thereby reducing geomorphic function and riparian succession below those facilities. The total direction and magnitude of these effects associated with climate change and sea level rise are uncertain. However, the adaptive capability and resilience of the system, as described above, would be improved with proposed Project implementation.

Relatively fuller reservoirs (such as associated with proposed Project implementation) may improve resiliency to climate change and sea level rise for geomorphic functions and riparian success.

Flood Control and Management (Chapter 9)

Climate change and sea level rise are anticipated to affect flood management. Water storage levels in existing reservoirs with climate change and sea level rise are expected to trend down. This result is shown in the sensitivity analysis No Project/No Action scenario. This effect could provide some improvement in flood management capability by providing more space in reservoirs for flood events. However, expected increases in the frequency and severity of high flow events would diminish flood management capability. The total magnitude and direction of effects on flood management is uncertain, and therefore, speculative. As noted in Chapter 9 Flood Control and Management, there would be some flood management benefit for the areas immediately downstream of the proposed Project dams that are prone to flooding. The adaptive capability related to flood management is less certain. As noted above, water system operators and managers would have more water to manage with proposed Project implementation than without. The expected additional water in storage could potentially provide operators and flood and water managers additional system resources to shift additional flood management protection to existing reservoirs, thus providing some resilience. This type of operation was not included in the proposed Project action alternatives formulations. Although this type of adaptive operation would be possible and would provide some resilience for flood management, this type of flood management operational change is speculative.

Groundwater Resources (Chapter 10)

Groundwater resources are likely to be affected by climate change and sea level rise. Groundwater use is expected to increase as surface water availability is affected by increasing temperatures, as runoff shifts, and due to Delta salinity intrusion that would require additional water quality dedicated releases from reservoirs. Comparative effects of the proposed Project would likely be similar with current conditions, when compared to climate change and sea level rise conditions. Some resilience of groundwater resources may be provided by proposed Project benefits because the water system (i.e., surface and groundwater) would be improved by proposed Project reliability benefits and improved surface water storage conditions. For example, a more reliable surface water system would reduce dependence upon the groundwater system. Consequently, the adaptive capability and resilience of the surface water system would improve the resiliency of the groundwater resources that are expected to lose resilience with climate change and sea level rise.

Groundwater Quality (Chapter 11)

Climate change and sea level rise are expected to affect groundwater quality due to the anticipated changes in runoff, increased soil temperature, and Delta salinity intrusion. Specific climate change and sea level rise effects, as well as potential changes to identified proposed Project impacts to groundwater quality within the three study areas, are uncertain.

Aquatic Biological Resources (Chapter 12)

Climate change and sea level rise are expected to affect aquatic biological resources due to the anticipated increased air and water temperatures, altered runoff and erosion, Delta salinity intrusion, and increased acidification of ocean waters from increased CO_2. The ability of water system operators to maintain stream temperatures that support salmonids would likely be increasingly challenged as the coldwater pools at existing reservoirs are compromised due to other increasing system needs. Increased air temperatures are expected to lead to increased water temperatures in streams and reservoirs. The climate change and sea level rise sensitivity analysis indicates a trend of decreased water in storage for the No Project/No Action Alternative. As climate change effects increase over time, more water is expected to be required to meet Delta salinity standards, which would decrease the amount of water available for all other purposes, including instream fishery needs such as coldwater pool management and stream temperature maintenance.

As noted previously, the proposed Project alternative operations with climate change were modified (when compared to the proposed Project alternatives operations with current climate) to emphasize coldwater pool management over the delta smelt habitat supplemental flows. Some Project-related water quality improvements would persist (as noted above). The proposed Project would provide significant adaptive capability for water and fishery managers that face uncertain future conditions, including climate change and sea level rise. The fish survival actions that improve the coldwater pools at existing reservoirs and provides supplemental temperature flows downstream would provide some resilience to increased water temperatures that are expected with climate change and sea level rise. Improved water in storage would improve water system operators' ability to support system objectives, including maintaining and improving anadromous fish habitat. The benefits associated with fish survival, with the exception of supplemental flows for delta smelt, appear to be sustainable with the climate change and sea level rise trend.

The NODOS Investigation has made recommendations to support an adaptive approach to the fishery benefits provided by the proposed Project. Conceptually, the fishery benefits would be supported by a proposed Project EESA, as described in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives. More practically, a portion of proposed Project resources (i.e., storage and conveyance) would be committed to providing eight water-related actions to improve anadromous fish habitat at and downstream of existing CVP and SWP reservoirs and in the Delta. The relative priorities of ecosystem actions supported by the EESA may change over time. Climate change and sea level rise effects may warrant some adaptation of the EESA. Modifications could be made with the approval of member agencies of a proposed governing board. This adaptive capability would support the resilience of the proposed Project and its benefits.

Botanical Resources (Chapter 13)

Climate change and sea level rise are expected to affect botanical resources due to the anticipated increased air and water temperatures, altered runoff and erosion, increased frequency and severity of flood and drought events, and salinity intrusion in the Delta. These effects could result in changes in vegetation species abundance (including invasive species), habitat quality, species range, and the spread of pests. The relative effect of climate change and sea level rise upon the identified proposed Project impacts to botanical resources is uncertain.

Terrestrial Biological Resources (Chapter 14)

Climate change and sea level rise are expected to affect terrestrial biological resources due to the anticipated higher temperatures, altered runoff and erosion, increased frequency and severity of flood and drought events, and Delta salinity intrusion. These effects are expected to contribute to decreased wildlife species abundance and habitat quality. However, some of these effects could improve conditions for certain species. For example, the anticipated increased frequency and severity of flood events and associated erosion with climate change would likely increase the quantity and quality of bank swallow nesting habitat.

The climate change sensitivity analysis indicates a general decrease in storage at existing reservoirs with the No Project/No Action Alternative. The analysis also indicates an increase in storage with proposed Project implementation, when compared to the No Project/No Action Alternative. This Project-related increase in storage would likely benefit bald eagles because long-term monitoring data from Shasta Reservoir indicate that bald eagle production increases as reservoir surface water elevation increases. The relative effect of climate change and sea level rise upon the identified proposed Project impacts to terrestrial biological resources is uncertain.

Wetlands and Other Waters of the U.S. (Chapter 15)

Climate change and sea level rise are expected to affect wetlands and other waters of the U.S. Because wetlands and waters of the U.S. are a subset of surface water resources, the effects described for surface water resources would also apply to this resource. The effects include increased air, water, and soil temperatures; altered runoff; increased frequency and severity of floods and droughts; and Delta salinity intrusion. In addition, decreased species abundance and habitat quality, the spread of pests, and increased fire risk would affect wetlands. The proposed Project would provide improvements and adaptive capability to the water resources systems of the State, including the CVP and SWP and their respective facilities and associated watersheds, including improved storage conditions. Improved storage may provide some resilience to the effects of climate change and sea level rise upon wetlands and waters of the U.S. Relatively fuller reservoirs would more effectively support downstream wetlands and waters of the U.S. that are dependent upon either deliveries or streamflow. The relative effect of climate change and sea level rise upon the identified proposed Project impacts to wetlands and other waters of the U.S. is uncertain.

Geology, Minerals, Soils, and Paleontology (Chapter 16)

Climate change and sea level rise could affect geology, minerals, soils, and paleontology due to the anticipated increased soil temperature, altered runoff, increased frequency and severity of flood and drought events, increased Delta salinity intrusion, and changes in rates of erosion. The relative effect of climate change and sea level rise upon identified proposed Project impacts to these resources is uncertain.

Faults and Seismicity (Chapter 17)

Faults and seismicity are not expected to be affected by climate change and sea level rise. However, if there is an effect, the relative effect of climate change and sea level rise upon identified proposed Project impacts to this resource is uncertain.

Cultural Resources (Chapter 18)

Climate change and sea level rise are expected to affect cultural resources due to the anticipated increased soil temperatures, altered runoff and erosion, increased frequency and severity of flood and drought events, Delta salinity intrusion, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project impacts to cultural resources is uncertain.

Indian Trust Assets (Chapter 19)

The nature of Indian Trust Assets indicates a potential connection to other resource areas including land use, surface water, minerals, and terrestrial and aquatic biological resources. However, as noted in Chapter 19, there are no ITAs within the vicinity of the proposed Project study areas.

Land Use (Chapter 20)

Land use is expected to be affected by climate change and sea level rise due to the anticipated increased air and soil temperature, altered runoff, Delta salinity intrusion, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project impacts to land use is uncertain.

Recreation Resources (Chapter 21)

Climate change and sea level rise are expected to affect recreation resources due to the anticipated increased temperatures, altered runoff, increased frequency and severity of flood and drought events, and Delta salinity intrusion. These effects could result in changes in species abundance, habitat quality, pest populations, and fire risk. Proposed Project implementation would result in increased surface water level fluctuations at San Luis Reservoir. The relative effect of climate change and sea level rise upon identified proposed Project impacts to San Luis Reservoir is uncertain.

Generally, recreation opportunities would be diminished when reservoir water storage levels are low. Implementation of the proposed Project action alternatives is expected to improve storage conditions in the reservoirs north of the Delta, including Trinity, Shasta, Oroville, and Folsom. The higher reservoir levels associated with proposed Project implementation would provide recreation benefits at those reservoirs. With climate change and sea level rise, the trend of Alternative C additional water in storage at existing reservoirs would be reduced, but would still be an improvement, when compared to the No Project/No Action Alternative.

Socioeconomics (Chapter 22)

Climate change and sea level rise are expected to affect socioeconomics due to the anticipated increased temperatures, altered runoff, increased frequency and severity of flood and drought events, Delta salinity intrusion, spread of pests, and increased fire risk. Specifically, climate change and sea level rise effects to the CVP and SWP water systems could have various negative effects to socioeconomics, including an increase in the price and availability of water, increasing crop prices as well. The relative effect of climate change and sea level rise upon identified proposed Project impacts to socioeconomics is uncertain. From a proposed Project perspective, the array of benefits appears to be sustainable with climate change and sea level rise (refer to Figures 25-10 through 25-12). The unit value of the benefits would likely be greater with the effects of climate change and sea level rise, assuming a typical supply and demand response (i.e., as supply is diminished by climate change and sea level rise effects, a shortage would result in higher water prices or value). Because the proposed Project benefits associated with Project objectives appear sustainable and the unit values would likely be greater, some resilience or positive socioeconomic effects appear likely with climate change and sea level rise as well.

Environmental Justice (Chapter 23)

Climate change and sea level rise are expected to affect the general population. Consequently, similar effects are anticipated with minorities and low-income populations (i.e., environmental justice populations) as well due to the anticipated increased temperatures, increased severity and frequency of flood and drought events, Delta salinity intrusion, changes in species range, and distribution, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project impacts to environmental justice populations is uncertain.

Air Quality (Chapter 24)

Climate change and sea level rise are expected to affect air quality due to the anticipated increased air temperatures, increased frequency and severity of floods, increased fire risk, and ocean acidification. The relative effect of climate change and sea level rise upon identified proposed Project impacts to air quality is uncertain.

Climate Change and Greenhouse Gas Emissions (Chapter 25)

Proposed Project operations would be similar with and without climate change and sea level rise. The effects upon total GHG emissions associated with the proposed Project and pumping specifically would be compensated by the GHG emission improvements related to the renewable integration operation of the Project, as described in the GHG emissions portion of this chapter.

Navigation, Transportation, and Traffic (Chapter 26)

Climate change and sea level rise are expected to affect navigation, transportation, and traffic due to the anticipated increased frequency and severity of floods. The relative effect of climate change and sea level rise upon identified proposed Project impacts to navigation, transportation, and traffic is uncertain.

Noise (Chapter 27)

Noise is not expected to be affected by climate change and sea level rise. However, if there is an effect, the relative effect of climate change and sea level rise upon identified proposed Project impacts to this resource is uncertain.

Public Health and Environmental Hazards (Chapter 28)

Climate change and sea level rise are expected to affect public health and environmental hazards due to the anticipated increased temperatures, increased frequency and severity of floods and droughts, Delta salinity intrusion, spread of pests, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project effects to public health and environmental hazards is uncertain.

Public Services and Utilities (Chapter 29)

Climate change and sea level rise is expected to potentially affect public services and utilities due to anticipated increased temperature, increased frequency and severity of flood and drought events, spread of pests, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project effects to public service and utilities is uncertain.

Visual Resources (Chapter 30)

Climate change and sea level rise are expected to affect visual resources due to the anticipated increased air and water temperatures, increased severity and frequency of flood and drought events, changes in vegetation and wildlife species distribution, and increased fire risk. The relative effect of climate change and sea level rise upon identified proposed Project effects to visual resources is uncertain.

Power Production and Energy (Chapter 31)

Climate change and sea level rise are expected to affect power production and energy due to the anticipated increased temperatures, altered runoff, and increased frequency and severity of flood and drought events. Some of these climate change and sea level rise effects would increase or decrease hydropower production; some would increase or decrease energy needs associated with the CVP and SWP systems. The proposed Project is intended to provide a specific kind of adaptive capability for power production and energy. Consistent with hydropower project objective, the proposed Project would provide hydropower facilities to support integration of renewable energy sources. The relative effect of climate change and sea level rise upon identified proposed Project impacts to power production and energy is uncertain.

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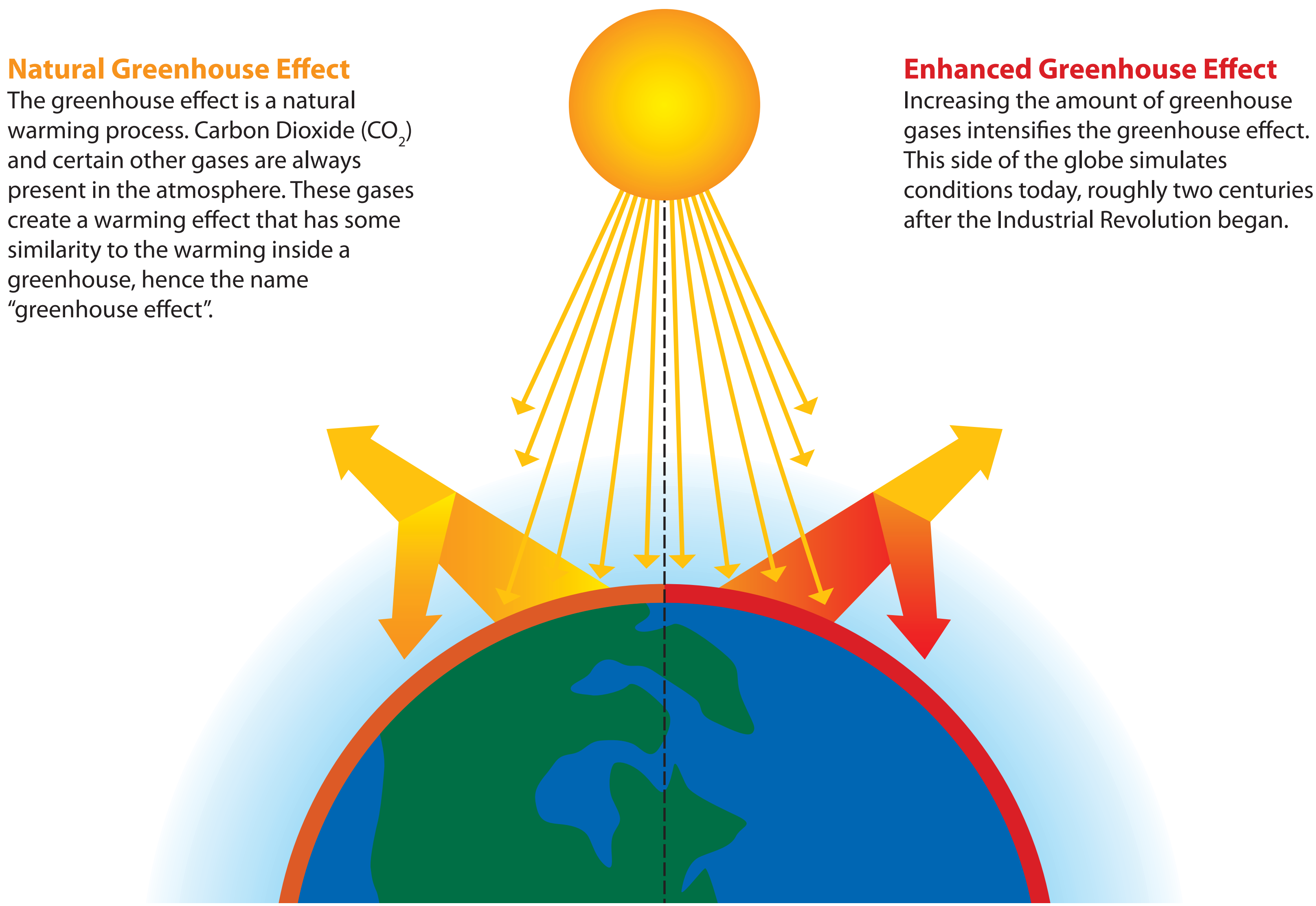
Figures



Source: Marion Koshland Science Museum of the National Academy of Sciences

FIGURE 25-1
The Greenhouse Gas Effect
North-of-the-Delta Offstream Storage Project

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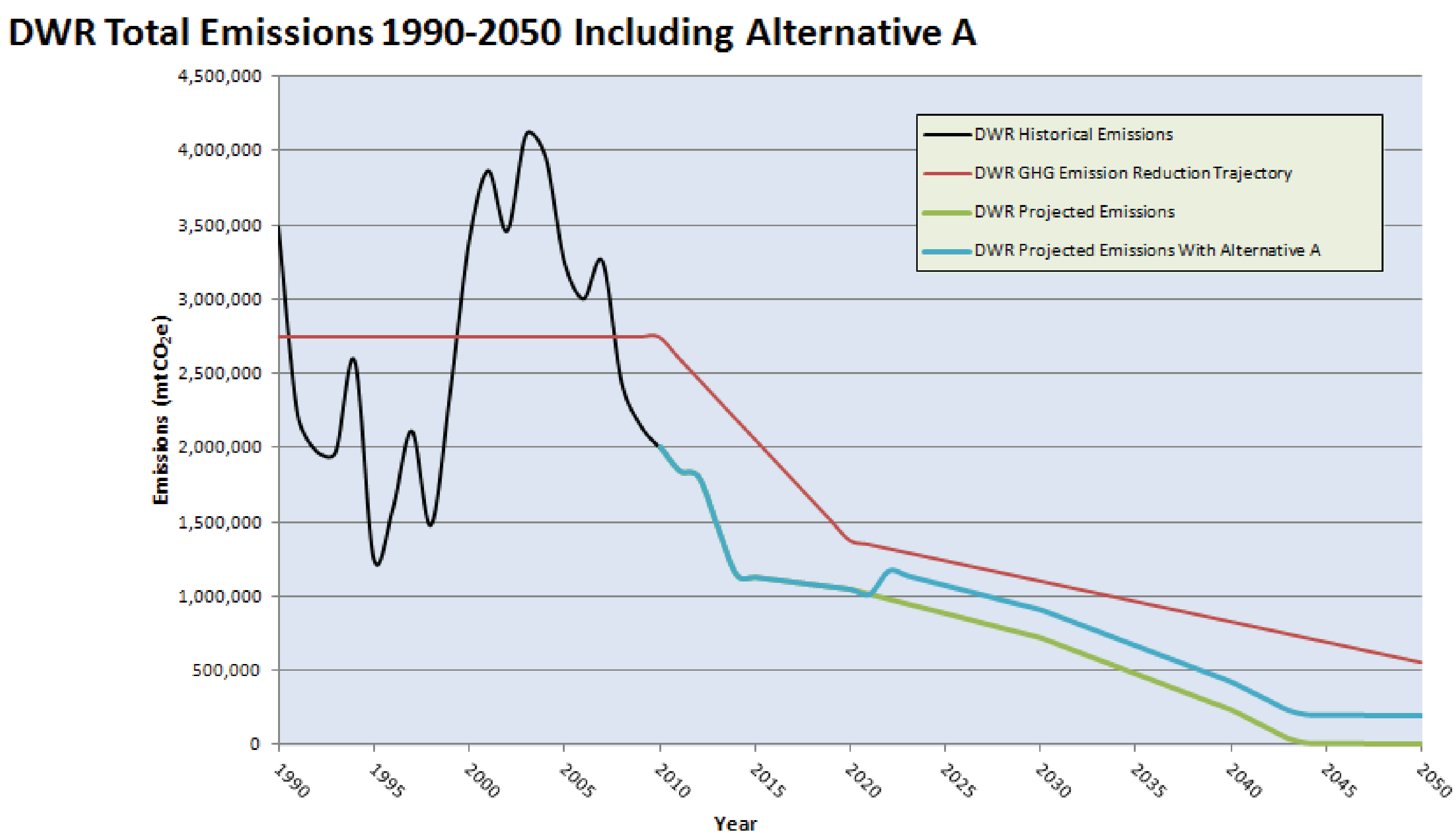


FIGURE 25-2
Alternative A Total Emissions - Historical and Projected, 1990-2050
North-of-the-Delta Offstream Storage Project

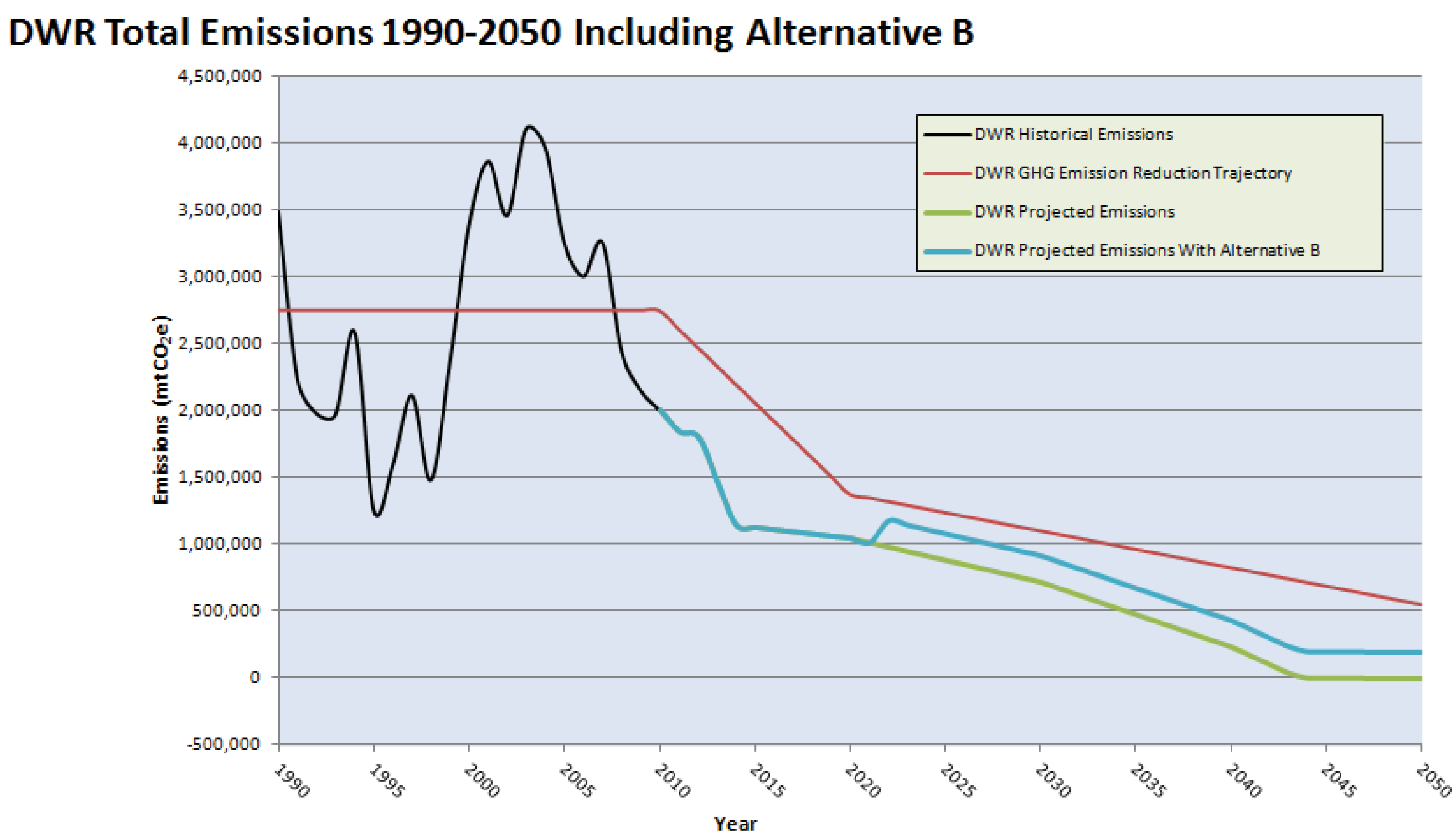


FIGURE 25-3
Alternative B Total Emissions - Historical and Projected, 1990-2050
North-of-the-Delta Offstream Storage Project

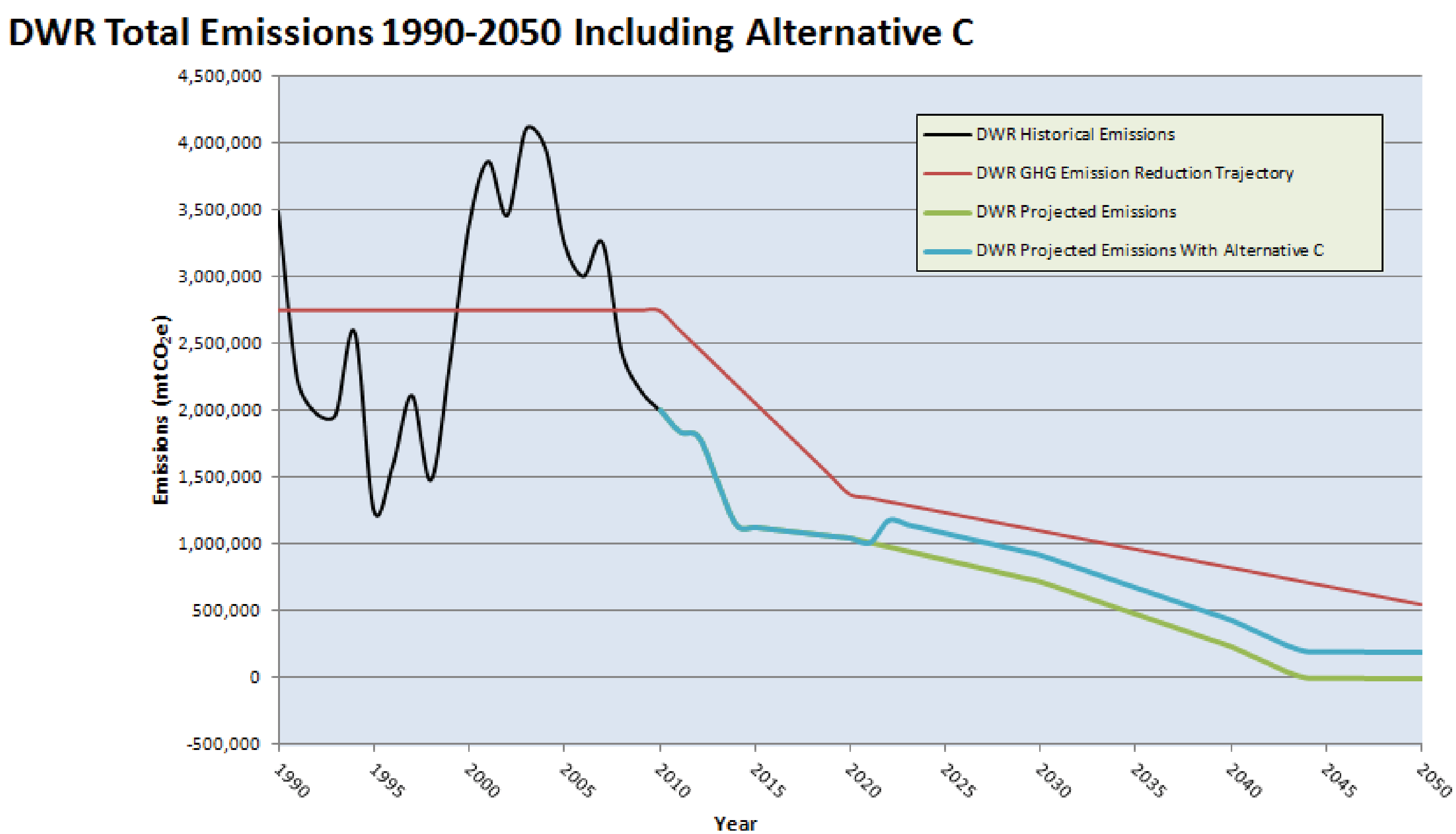
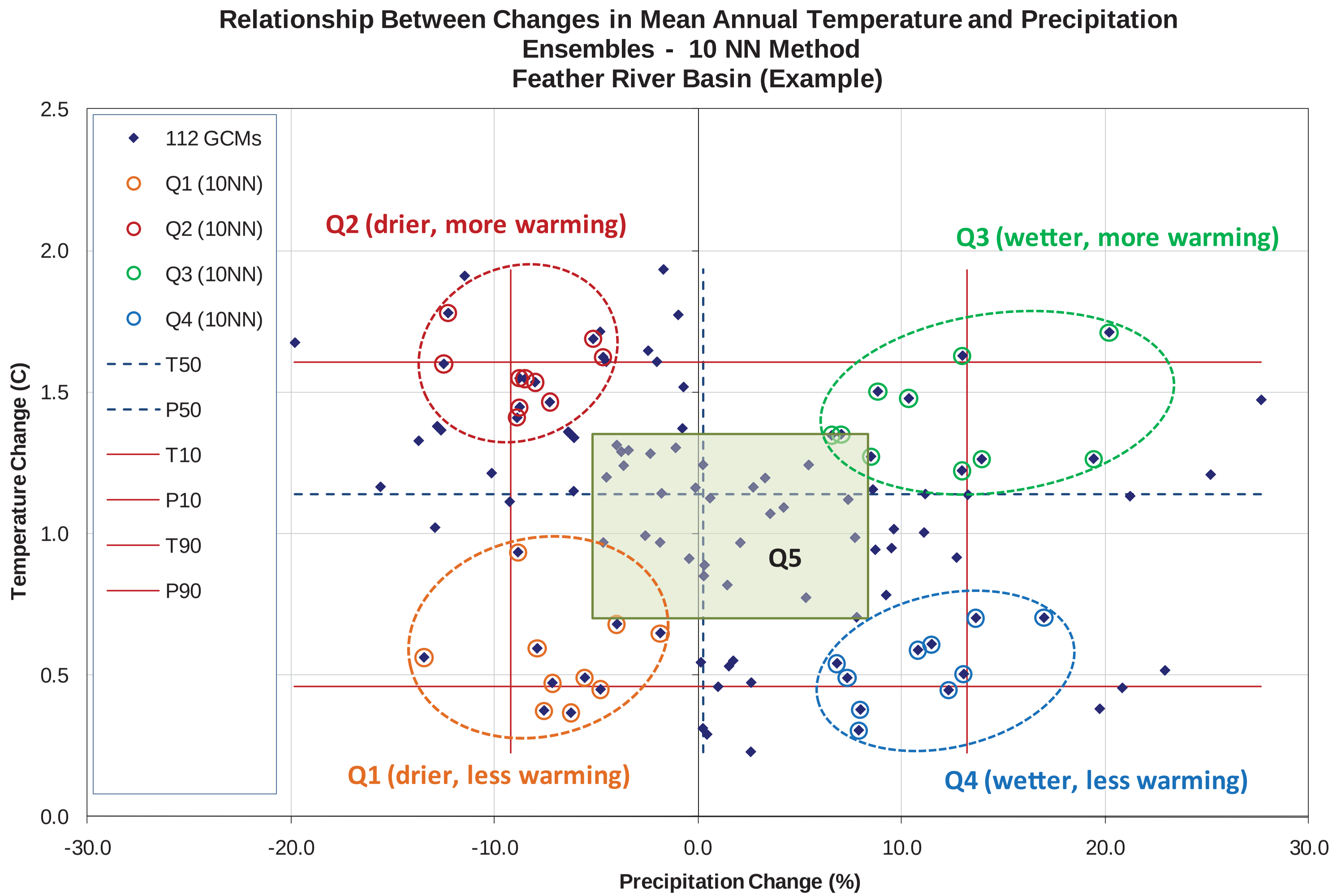


FIGURE 25-4
Alternative C Total Emissions - Historical and Projected, 1990-2050
North-of-the-Delta Offstream Storage Project



Note: The Q5 ensemble is bounded by the 25th and 75th percentile joint temperature-precipitation change. Ensembles Q1-Q4 are selected to reflect the results of the ten (10) projections nearest each of 10th and 90th joint temperature-precipitation change bounds.

FIGURE 25-5
Example Downscaled Climate Projections used for Deriving Climate Ensembles (Q1-Q5) for the Feather River Basin for the ELT Scenario (Year 2025, Climate Period 2011 to 2040)
North-of-the-Delta Offstream Storage Project

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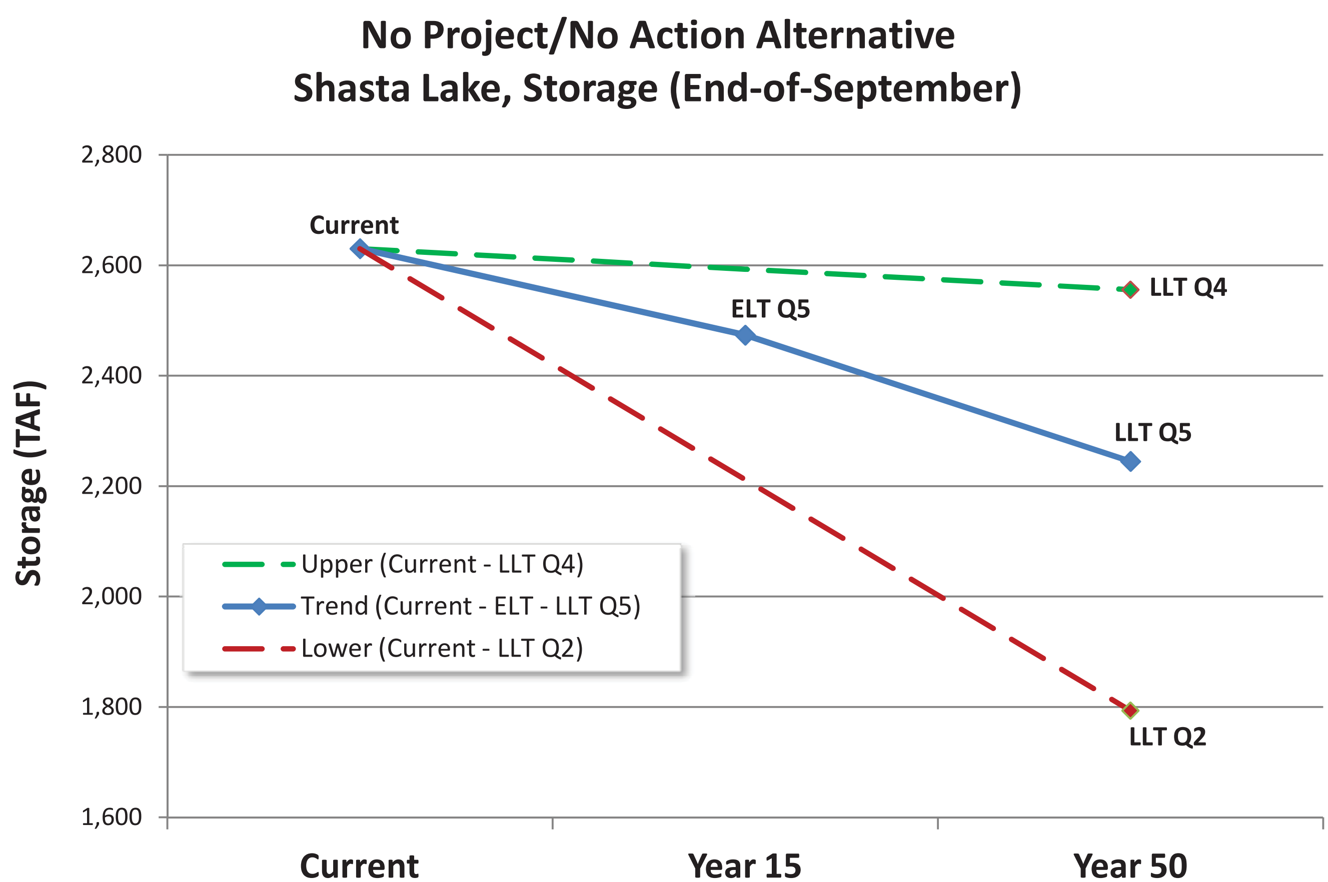

FIGURE 25-6
No Project/No Action Alternative Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios on Average Shasta Lake End-of-September Storage
North-of-the-Delta Offstream Storage Project

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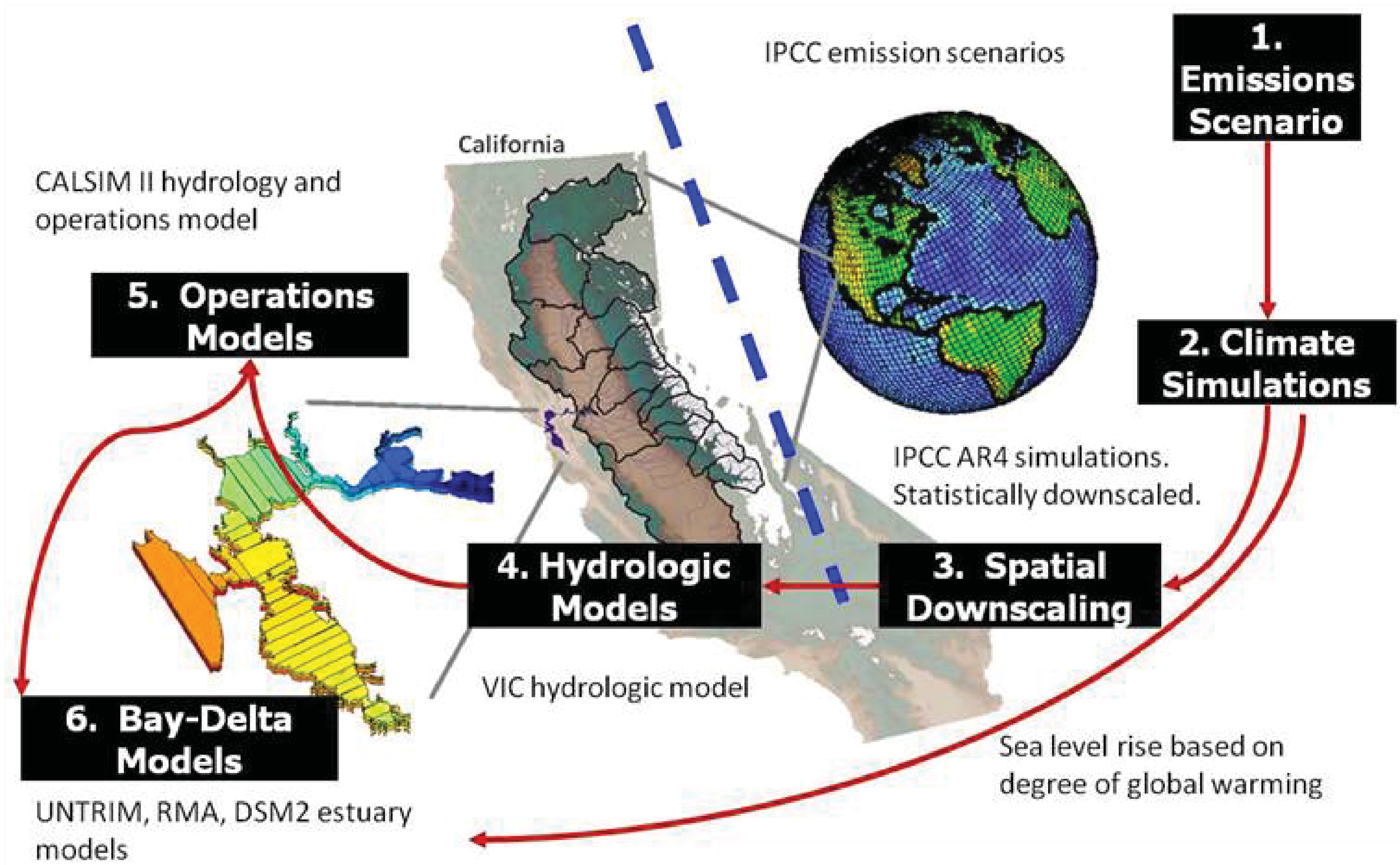

Adapted from Cayan and Knowles, SCRIPPS/USGS, 2003.

FIGURE 25-7
Graphical Depiction of the Analytical Process for Incorporating Climate Change into the CALSIM II Model for Water Resources Planning Purposes
North-of-the-Delta Offstream Storage Project

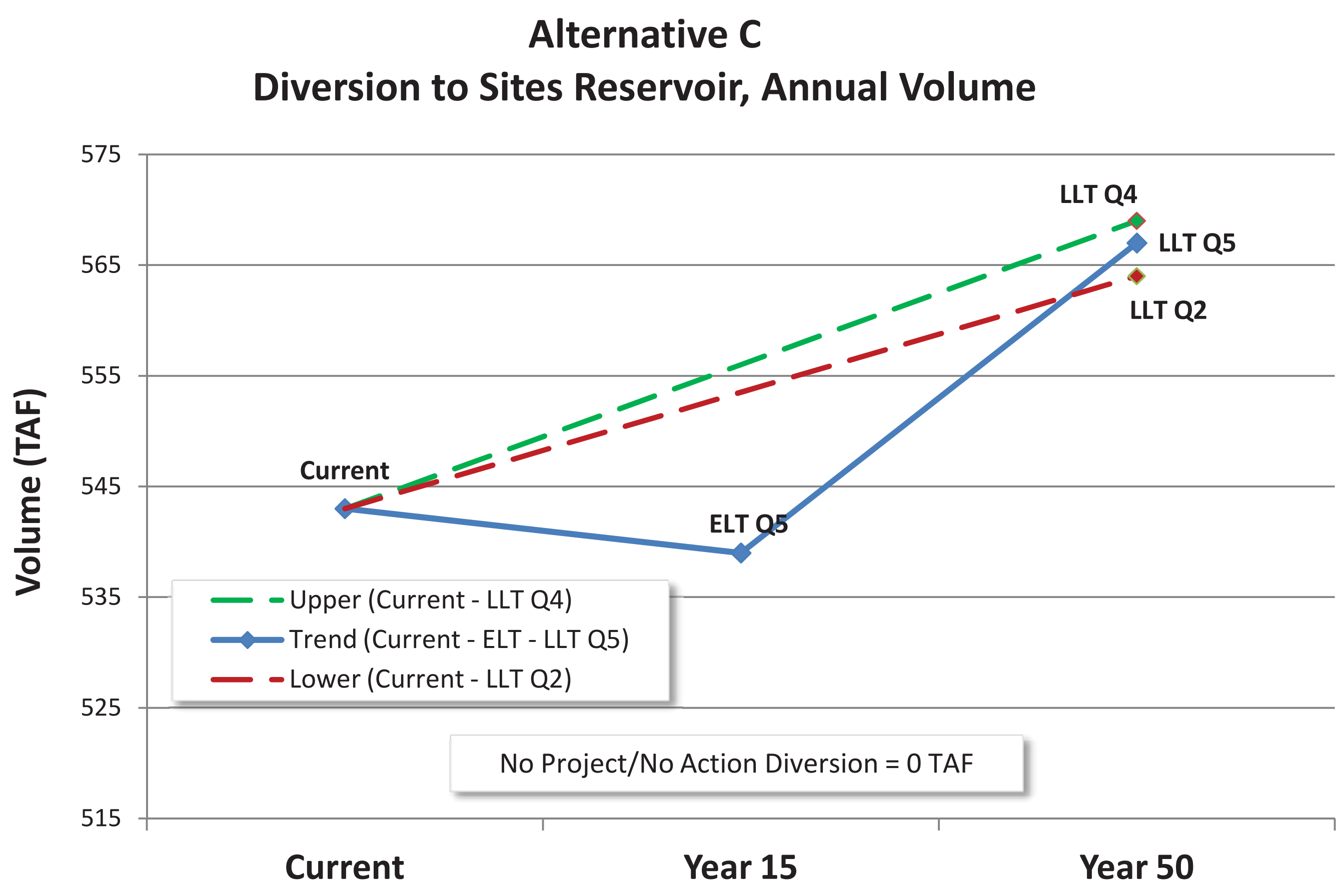

FIGURE 25-8
Alternative C Average Annual Diversion to Sites Reservoir Storage Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios
North-of-the-Delta Offstream Storage Project

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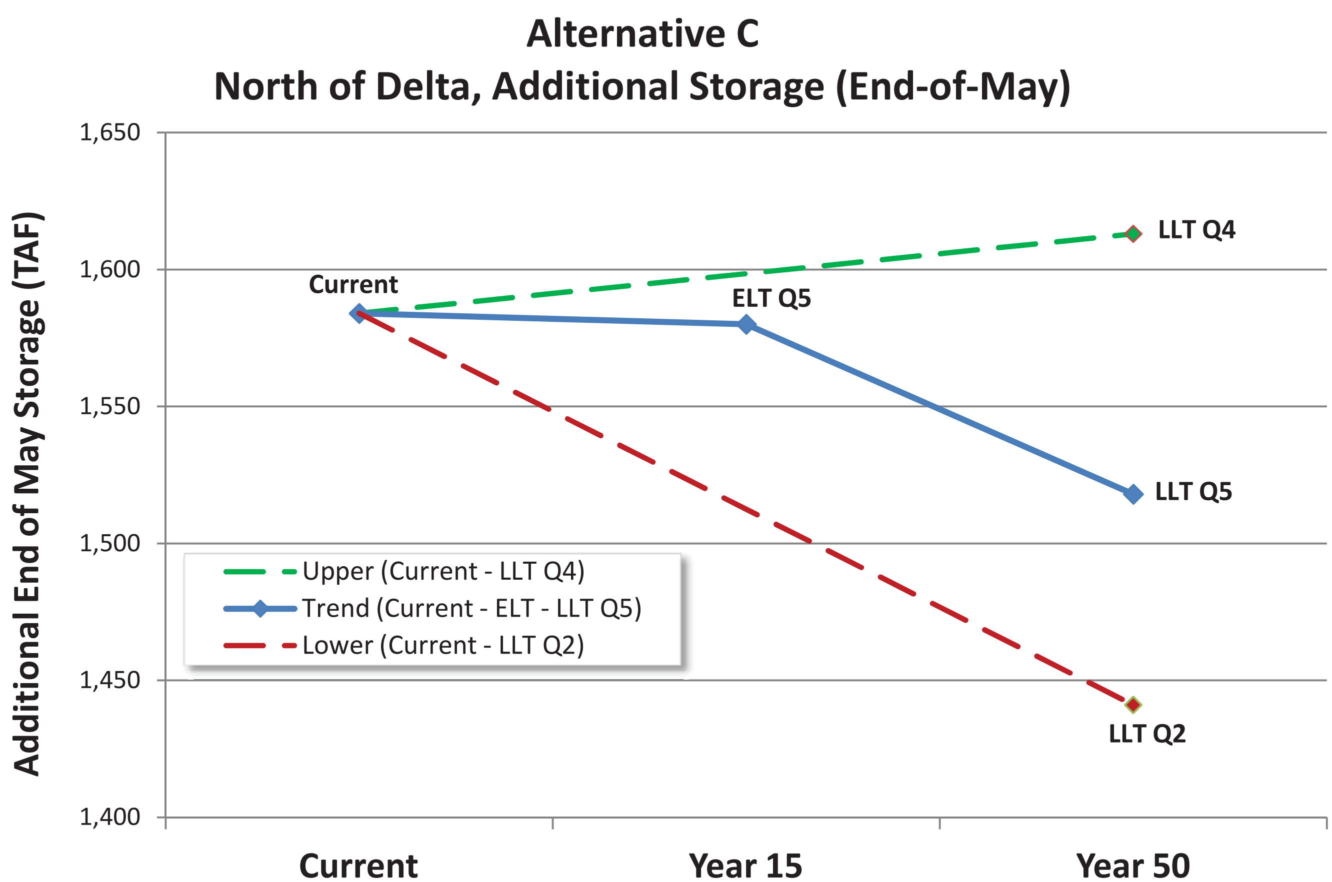

FIGURE 25-9
Alternative C Average Additional Water in Storage compared to the No Project/No Action Alternative, End of September, Including Trinity, Shasta, Oroville, and Folsom Reservoirs Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios
North-of-the-Delta Offstream Storage Project

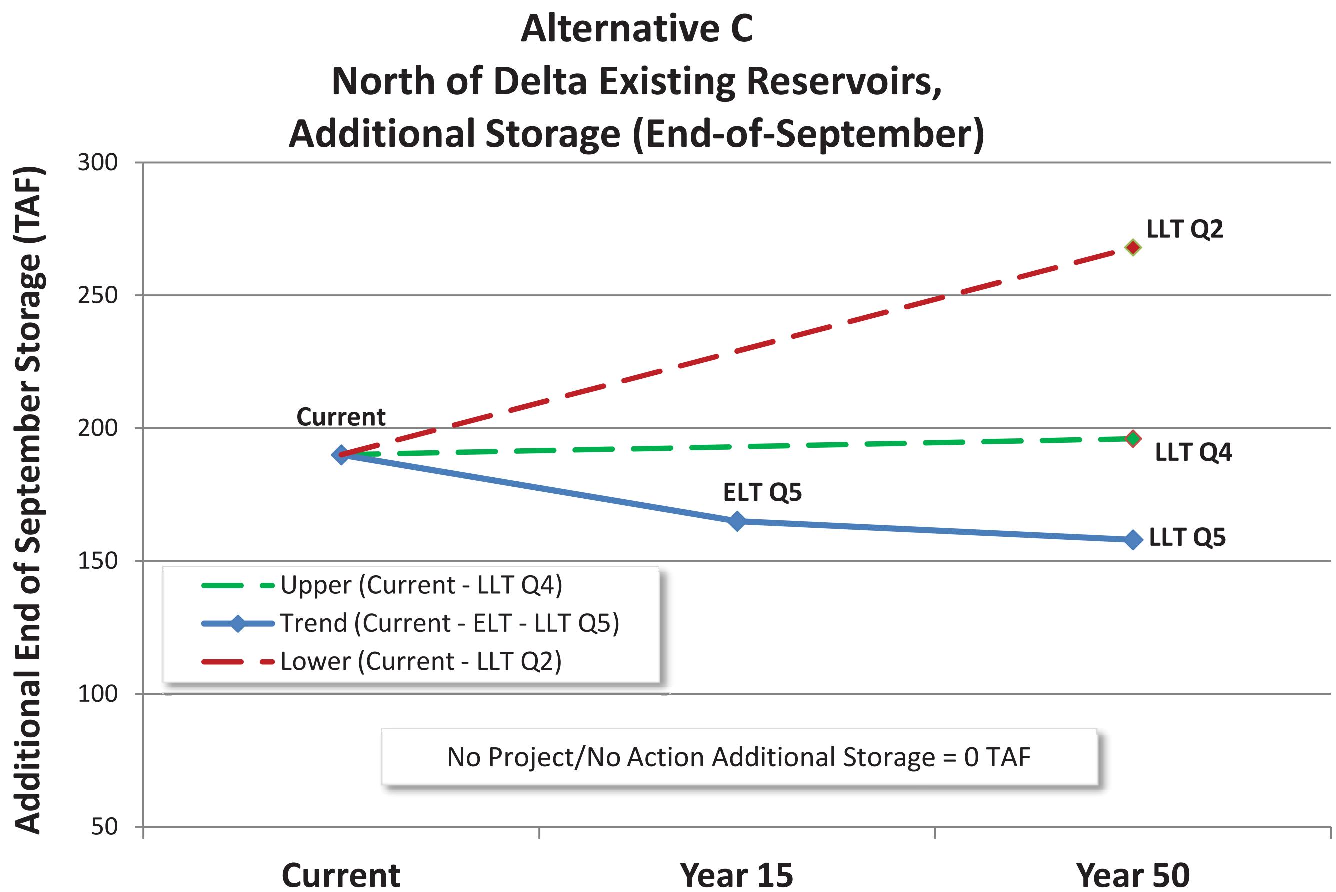

FIGURE 25-10
Alternative C Average Additional Water in Storage compared to the No Project/No Action Alternative, End of September, Including Trinity, Shasta, Oroville, and Folsom Reservoirs Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios
North-of-the-Delta Offstream Storage Project

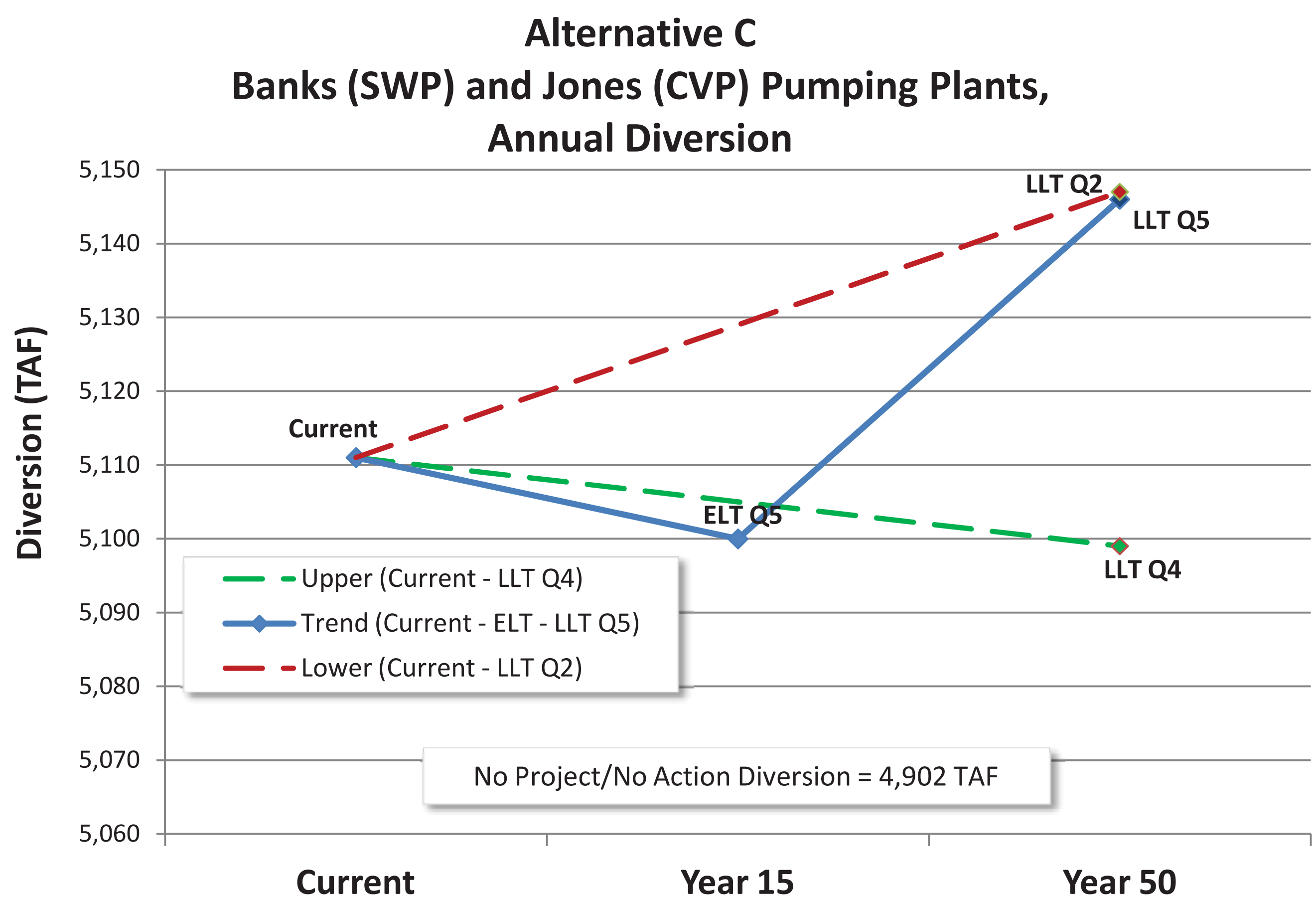

FIGURE 25-11
Alternative C Average SWP and CVP Exports from the Delta Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios
North-of-the-Delta Offstream Storage Project

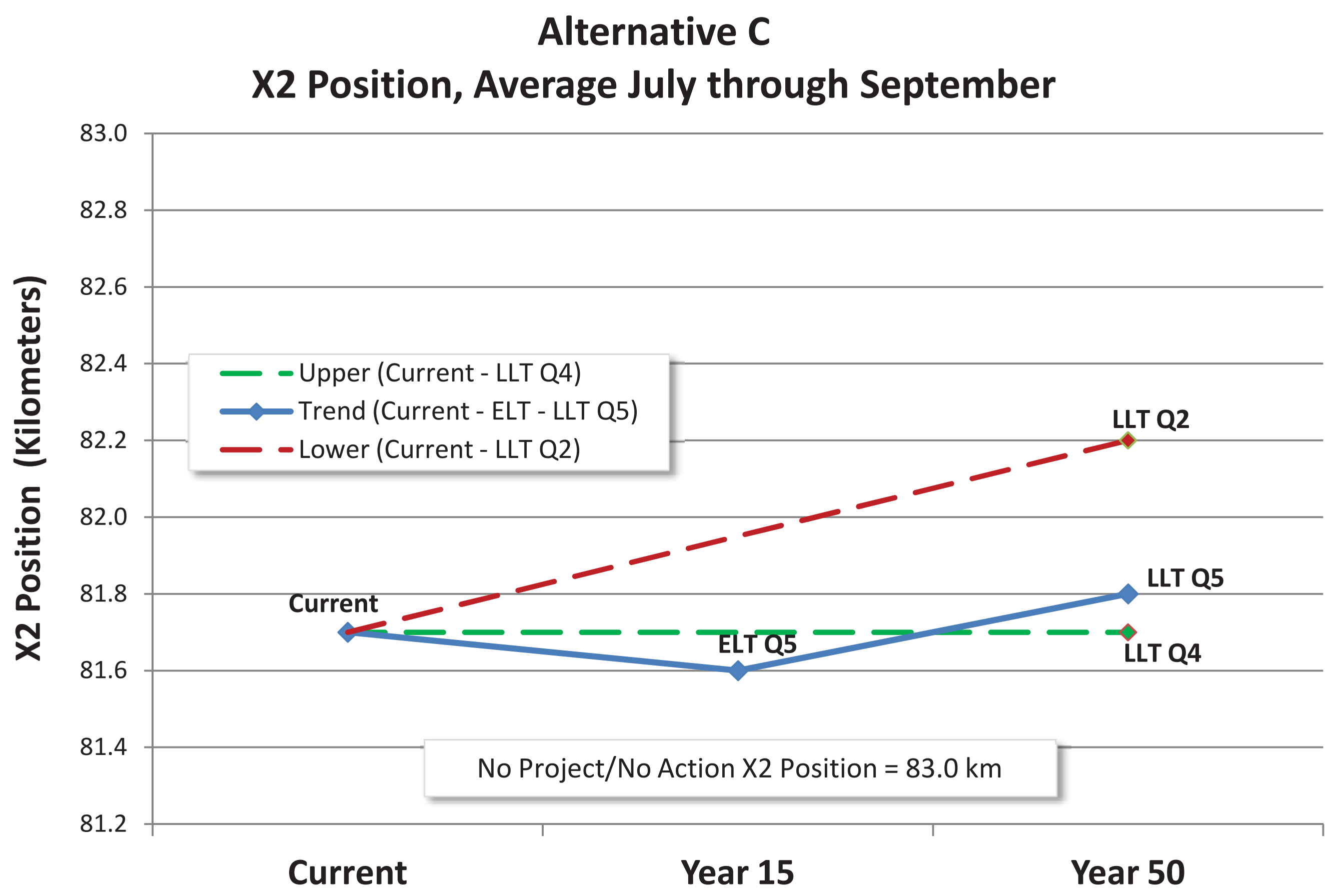

FIGURE 25-12
Alternative C Average X2 Position During July through September Showing the Trend and Range of Impact of ELT Q5, LLT Q5, LLT Q2, and LLT Q4 Climate Change and Sea Level Rise Scenarios
North-of-the-Delta Offstream Storage Project

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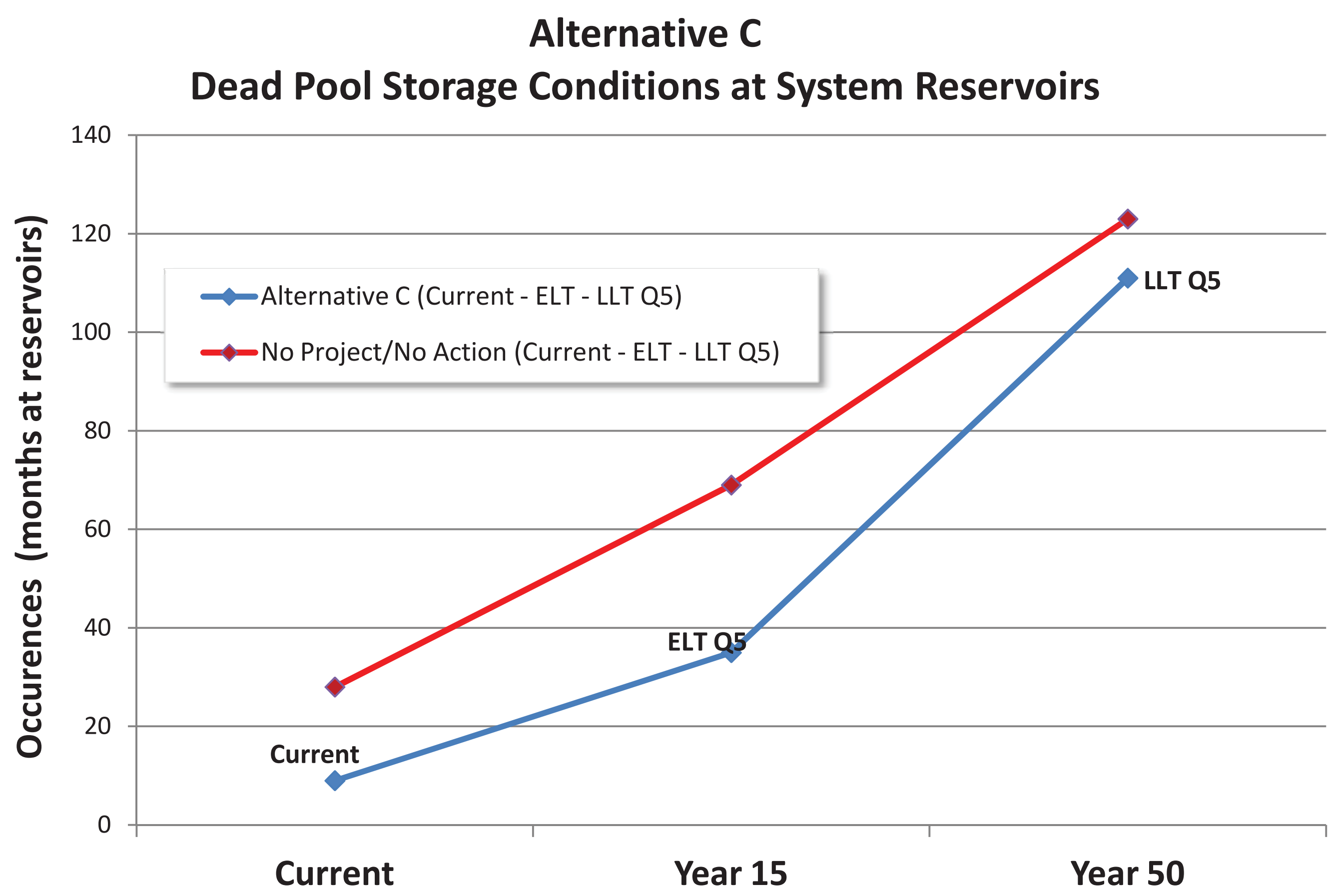

FIGURE 25-13
No Project/No Action Alternative and Alternative C Average Dead Storage Occurrences (Number of Months) at Trinity, Shasta, Oroville, Folsom, and San Luis reservoirs (Trend with Current, ELT Q5, and LLT Q5 Scenarios)
North-of-the-Delta Offstream Storage Project

26. Navigation, Transportation, and Traffic

26.1 Introduction

This chapter describes the existing navigation, transportation, and traffic conditions for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. The navigation section discusses the physical characteristics of major waterways in the three study areas, with emphasis on the waterways located in Glenn and Colusa counties. The transportation and traffic section focuses on the existing vehicle, rail, and air traffic facilities that are expected to be used during Project construction and operation or are located near the Project facility sites.

The regulatory setting for navigation, transportation, and traffic is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant impacts, where appropriate.

26.2 Environmental Setting/Affected Environment

26.2.1 Methodology

26.2.1.1 Navigation

Navigable waters for the purposes of this analysis have been defined using both the federal and State codes:

- Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity (33 CFR Part 329).
- Navigable waters means waters which come under the jurisdiction of the United States Corps of Engineers and any other waters within the state with the exception of those privately owned (California Harbor and Navigation Code, Chapter 1).

Major waterways within the Extended, Secondary, and Primary study areas were identified using maps, boating guides from the California Department of Boating and Waterways, and marine highway corridor guides from the U.S. Department of Transportation.

26.2.1.2 Transportation and Traffic

Roadway Condition

Pavement condition was determined by driving the roads that are the main access routes to Project facilities within Glenn and Colusa counties. The pavement condition categories and criteria for each category are provided in Table 26-1.

Table 26-1
Pavement Condition Categories and Criteria

Pavement Condition	Criteria
Good	Fully paved with very few cracks or potholes that result in desirable driving conditions
Fair	Fully paved with some cracks or potholes that result less-than-desirable driving conditions
Poor	Un-paved or paved with significant cracks and potholes that need to be avoided while driving and result in undesirable driving conditions

Source: MTC, 1986.

Roadway Classification

Major roadways within the Extended, Secondary, and Primary study areas were identified using Google maps. For the Primary study area, roadway classifications were determined using County general plans. As an example, the roadway classifications for Glenn County are presented in Table 26-2.

Table 26-2
Roadway Classifications for Glenn County

Roadway Classification	Description
Minor Collector	Carries traffic from residential subdivisions/settlements, farms, logging operations, and other local area trip generators to higher classification roads.
Collector	Primarily intra-county travel serving smaller communities and countywide trip generators, such as consolidated schools, freeway interchanges, major shipping terminals, major recreational facilities, and concentrations of commercial/industrial activity.

Source: Glenn County, 1993.

Roadway Level of Service

Both Glenn County and Colusa County use the Level of Service criteria, as defined by the 2000 Highway Capacity Manual (HCM), to assess the performance of its street and highway system and the capacity of roadways. Level of Service is a qualitative assessment of the quantitative effects of such factors as traffic volume, roadways geometrics, speed, delay, and maneuverability on roadway and intersection operations. Roadway traffic flow characteristics for different Levels of Service are described in Table 26-3.

Table 26-3
General Level of Service Criteria for Roadways

Level of Service	V/C	Traffic Flow Characteristics
A	0.00 – 0.60	Free flow; insignificant delays
B	0.61 – 0.70	Stable operation; minimal delays
C	0.71 – 0.80	Stable operation; acceptable delays
D	0.81 – 0.90	Approaching unstable flow; queues develop rapidly but no excessive delays
E	0.91 – 1.00	Unstable operation; significant delays
F	> 1.00	Forced flow; jammed conditions

Note:
V/C = traffic volume (demand) / roadway capacity ratio

Source: Transportation Research Board, 2010.

Traffic Operations and Capacity

Average Daily Traffic (ADT) volumes were estimated for representative segments of the roadways that would be used to access the site of the proposed pump installation at the Red Bluff Pumping Plant (a Secondary Study Area Project facility). A four percent growth factor was applied to the most recent ADT counts available from Tehama County and the California Department of Transportation (Caltrans), and was determined from historical traffic data.

ADT volumes for 2010 for Glenn County roads were estimated based on a three percent growth factor applied to the most recent ADT counts available from Glenn County and Caltrans. A three percent growth factor was determined from historical data in the Glenn County General Plan (Glenn County, 1993).

ADT volumes for 2010 for Colusa County roads were estimated based on a two percent growth factor applied to the most recent ADT counts available from Colusa County and Caltrans. A two percent growth factor was determined from historical data in the Colusa County General Plan (Colusa County, 1989).

An update to the Glenn County General Plan (1993) began in 2006, but has since been put on hold and an estimate for completion of that update is not available. The Colusa County General Plan was updated in July 2012. For planning-level analysis, Caltrans identifies Level of Service D as the acceptable mobility criteria. The Glenn County and Colusa County general plans both identify Level of Service C as the acceptable mobility criteria (Glenn County, 1993 and Colusa County, 2012). These criteria were used for the quantitative analysis for roadways within the Primary Study Area. A description of roadway operations for each Level of Service and the associated criteria for Caltrans roadways are presented in Table 26-4. A description of roadway operations for each Level of Service and the associated criteria for Glenn and Colusa County roadways are presented in Table 26-5.

Table 26-4
Caltrans Average Daily Traffic Level Of Service Criteria

Level of Service	Two-Lane Highway	Four-Lane Freeway
A	Undefined	Undefined
B	< 3,300	< 22,400
C	< 7,100	< 32,300
D	< 13,100	< 42,500
E	< 24,900	< 49,700
F	24,900	49,700

Source: Transportation Research Board, 2010.

The Caltrans average daily traffic Level of Service criteria are based on two- and four-lane highway daily service volumes as defined by the HCM. The terrain and traffic patterns assumed for these criteria are consistent with those observed in the Primary Study Area. The HCM does not provide average daily traffic Level of Service criteria for interstate freeways. The four-lane highway Level of Service criteria are considered appropriate for I-5 within the Primary Study Area. Some roadways to the Project facility sites may not have vehicle count information available. For these facilities, Level of Service operational analysis has not been conducted.

Table 26-5
Glenn and Colusa County Average Daily Traffic Level Of Service Criteria

Level of Service	Minor Collector (2-lane)	Collector (2-lane)
A	< 1,000	< 1,300
B	< 3,000	< 3,900
C	< 5,500	< 7,500
D	< 8,750	< 12,600
E	< 11,200	< 16,900
F	11,200	16,900

Source: Fehr & Peers, 2009.

26.2.2 Extended Study Area

26.2.2.1 Navigation

The 39 counties that are included within the Extended Study Area have many navigable waterways. Marine traffic within the Extended Study Area varies from commerce to recreation. Marine traffic congestion varies from waterway to waterway and by study area, but generally, there is expected to be more commercial traffic (e.g., in the shipping lanes near the ports) during working hours Monday through Friday, and there is expected to be more recreational traffic during weekends and holidays.

Marine facilities represent substantial transportation capacity within the Extended Study Area. Navigable coastal waters parallel the entire I-5 corridor, including numerous deep and safe rivers, bays, and ports and serving as extensions of the surface transportation system, particularly for freight and goods movement. Commercial ports, ferries, and bridges exist within the Extended Study Area and include facilities that are part of the Marine Highway Program overseen by the U.S. Department of Transportation Maritime Division.

Two designated Marine Highway (M-) corridors lie within the Extended Study Area: the M-5 corridor and the M-580 corridor. The M-5 corridor includes the Pacific Ocean coastal waters, connecting commercial navigation channels, ports, and harbors from San Diego to the U.S.-Canada border north of Seattle, Washington. The corridor spans Washington, Oregon, and California along the West Coast. It connects to the M-84 corridor at Astoria, Oregon, and the M-580 corridor at Oakland, California. The M-580 corridor includes the San Joaquin River, Sacramento River, and connecting commercial navigation channels, ports, and harbors in Central California from Sacramento to Oakland (USDOT, 2010).

Typical marine traffic within the Extended Study area is described geographically in Table 26-6.

Neither San Luis Reservoir, nor the Wildlife Refuges, within the Extended Study Area, is considered to be a navigable waterway.

Table 26-6
Navigable Waters in the Counties that Comprise the Extended Study Area

Geographic Area	Description of Typical Navigation	Major Waterways	Counties
Shasta Lake	Houseboats and smaller recreational watercraft, consisting of kayaks, canoes, personal sailing crafts, jet-skis, and small motorized boats for fishing and water skiing. Ferry service to the Shasta Caverns on the McCloud arm of the Lake.	Pit River, McCloud River, Sacramento River, Squaw Creek	Shasta
Upper Central Valley (Sacramento Valley)	The majority of the Sacramento Valley waterways are limited to small recreational watercraft and sport fishing by flows and waterway depths. The Lower Sacramento River carries marine traffic through the Sacramento Deep Water Ship Channel.	Sacramento River, Bear River, Feather River, Yuba River	Butte, Colusa, Glenn, Placer, Plumas, Sutter, Tehama, Yolo
Lower Central Valley (San Joaquin Valley)	The majority of the San Joaquin Valley waterways are limited to small recreational watercraft and sport fishing by flows and waterway depths. The Lower San Joaquin River carries marine traffic and through the Port of Stockton.	San Joaquin River, Stanislaus River, Kings River, Merced River, Kern River, Kaweah River	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare
Sacramento-San Joaquin Bay-Delta	Commercial navigation channels and ports are prevalent within the Bay-Delta. There is a high volume of recreational traffic within this area, consisting of motorized marine craft for fishing, skiing, and boating.	Sacramento-San Joaquin Delta, American River, Folsom Lake, Sacramento River, Napa River, Napa-Sonoma Marsh, Suisun Bay, San Pablo Bay	Alameda, Contra Costa, Sacramento, Solano, Napa
Gold Country	The majority of these waterways are limited to small recreational watercraft and sport fishing by flows, structures (e.g., dams), and waterway depths.	Calaveras River, Stanislaus River, Tuolumne River, Lake Tahoe, American River, Folsom Lake, Cosumnes River, Mokelumne River	Calaveras, El Dorado, Nevada, Tuolumne
Central Coast	The majority of these waterways are limited to small recreational watercraft and sport fishing by flows, structures (e.g., dams), and waterway depths.	Pajaro River, San Lorenzo River, Santa Ynez River, Santa Maria River, Lake Cachuma	Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz
South Coast/Inland Empire	These waterways are primarily seasonal, and in some instances, channelized by concrete. The Colorado River is the largest and most widely trafficked of the waterways. Traffic is generally recreational.	Ventura River, Los Angeles River, Santa Clara River, San Gabriel River, Santa Ana River, San Diego River, Tijuana River, Colorado River	Los Angeles, Orange, San Diego, San Bernardino, Ventura
Salton Sea	Recreational watercraft only.	Salton Sea, New River, Whitewater River, Alamo River	Imperial, Riverside

Source: USDOT, 2010; maps.google.com, 2013.

26.2.2.2 Transportation and Traffic

The Extended Study Area includes many freeways, highways, and local roadways. For each of the 39 counties that comprise the Extended Study Area, Table 26-7 lists the major roadways (i.e., interstate freeways [I], U.S. highways [U.S.], and State Routes [SRs]). Traffic congestion in these areas can vary considerably depending on the location, season, and time of day. Typical baseline conditions are congestion during commute hours on weekdays in urban settings, and congestion on weekends and off-peak hours on weekdays if these roads serve recreational facilities or recreational areas.

Table 26-7
Major Roadways in the Extended Study Area

County	Major Roadways
Alameda	I-80, I-580, I-680, I-880, and I-980, and numerous SRs
Butte	SR 32, SR 70, SR 99, SR 149, SR 162, and SR 191
Calaveras	SR 4, SR 12, SR 26, and SR 49
Colusa	I-5, SR 16, SR 20 and SR 45
Contra Costa	I-80, I-680, SR 4, SR 24 and SR 242
El Dorado	SR 49, SR 193, SR 89, and U.S. 50
Fresno	I-5, SR 33, SR 41, SR 99, SR 145, SR 168, SR 180, and SR 198
Glenn	I-5, SR 45 and SR 162
Imperial	I-8, SR 86, and SR 111
Kern	I-5, SR 14, SR 58, SR 99, and SR 178
Kings	I-5, SR 33, SR 41, SR 43, and SR 198
Los Angeles	I-5, I-10, I-105, I-110, I-210, I-405, I-605, I-710 and numerous SRs
Madera	SR 41, SR 49, SR 99, and SR 145
Merced	I-5, SR 33, SR 99, and SR 152
Monterey	SR 1, SR 68, SR 183, and U.S. 101
Napa	I-80, SR 29, SR 121, SR 128, and SR 221,
Nevada	I-80, SR 20, SR 49, and SR 89
Orange	I-5, I-405, I-605, and numerous SRs
Placer	I-80, SR 20, SR 28, SR 49, SR 65, SR 89, SR 193, and SR 267
Plumas	SR 36, SR 70, SR 89, and SR 147
Riverside	I-15, I-215, I-10 and numerous SRs
Sacramento	I-5, I-80, SR 50, SR 99, SR 160, and U.S. 50
San Benito	SR 25, SR 146, SR 156 and U.S. 101
San Bernardino	I-10, I-15, I-40, I-215 and numerous SRs
San Diego	I-5, I-8, I-15, I-805, and numerous SRs
San Joaquin	I-5, I-205, I-580, SR 4, SR 33, SR 99, and SR 120
San Luis Obispo	SR 1, and U.S. 101
Santa Barbara	SR 1, SR 217, SR 154, and U.S. 101
Santa Clara	I-280, I-680, I-880, numerous SRs and U.S. 101
Santa Cruz	SR 1, and SR 17
Shasta	I-5, SR 44, and SR 273
Solano	I-80, I 505, I-680, I-780, SR 12, and SR 113
Stanislaus	I-5, SR 99, SR 120, SR 132,

Table 26-7
Major Roadways in the Extended Study Area

County	Major Roadways
Sutter	SR 20, SR 70, SR 99, and SR 113
Tehama	I-5, SR 36, and SR 99
Tulare	SR 99 and SR 198,
Tuolumne	SR 49 and SR 108
Ventura	SR 1, SR 23, SR 33, SR 118, SR 126 and U.S. 101
Yolo	I-5, I-80, I-505, SR 16, and SR 113

Notes:
I = Interstate Freeway
SR = State Route
U.S. = U.S. Highway

Source: maps.google.com, 2013.

26.2.3 Secondary Study Area

26.2.3.1 Navigation

Similar to the Extended Study Area, marine traffic congestion varies across the waterways and study area, but there is generally more commercial traffic (e.g., in the shipping lanes near the ports) during working hours Monday through Friday and more recreational traffic during weekends and holidays. There are 22 counties included in the Secondary Study Area. Fourteen of the 22 counties are also located in the Extended Study Area. Table 26-8 expands on the information provided in Table 26-6 by including the additional Secondary Study Area counties.

Table 26-8
Navigable Waters in the Counties that Comprise the Secondary Study Area

Geographic Area	Description of Typical Navigation	Major Waterways	Counties
Upper Central Valley (Sacramento Valley)	The majority of the Sacramento Valley waterways are limited to small recreational watercraft and sport fishing by flows and waterway depths. The lower Sacramento River carries marine traffic through the Sacramento Deep Water Ship Channel.	Sacramento River, Bear River, Feather River, Yuba River	Yuba
Sacramento-San Joaquin Bay-Delta	Commercial navigation channels and ports are prevalent within the Bay-Delta. There is a high volume of recreational traffic within this area, consisting of motorized marine craft for fishing, skiing, and boating.	Sacramento-San Joaquin Delta, American River, Sacramento River, Napa River, Napa-Sonoma Marsh, San Francisco Bay, Suisun Bay, San Pablo Bay	Sonoma, Marin, San Francisco, San Mateo
North Coast	Generally recreational motorized and non-motorized marine craft for fishing, skiing, and boating.	Klamath River downstream of the Trinity River, Trinity River, Smith River, Mad River, Eel River, Russian River, Navarro River	Del Norte, Humboldt, Trinity

Source: USDOT, 2010; maps.google.com, 2013.

26.2.3.2 Transportation and Traffic

For each of the 22 counties included in the Secondary Study Area, Table 26-9 lists the major roadways. Fourteen of the 22 counties in the Secondary Study Area are also located within the Extended Study Area (Table 26-7), and are not duplicated in Table 26-9. Similar to the Extended Study Area, traffic congestion in these areas can vary considerably depending on the location, season, and time of day. Typical baseline conditions are the same as those described for the Extended Study Area.

Table 26-9
Major Roadways in the Secondary Study Area

County	Major Roadways
Del Norte	I-101 and I-199
Humboldt	U.S. 101, SR 299
Marin	U.S. 101, SR 1, and SR 37
San Francisco	I-80, I-280, U.S. 101, SR 1, and SR 35
San Mateo	U.S. 101, I-280, I-380, SR 1, SR 82, SR 84, and SR 92
Sonoma	U.S. 101, SR 1, SR 12, SR 116, SR 121, and SR 128
Trinity	SR 3, SR 36, and SR 299
Yuba	SR 20, SR 65, and SR 70

Notes:

I = Interstate Freeway
SR = State Route
U.S. = U.S. Highway

Source: maps.google.com, 2013.

Three roadways in Tehama County were identified as primary access roads to the site of the proposed pump installation at the Red Bluff Pumping Plant. The roadways are listed in Table 26-10, including a summary of their observed characteristics.

Table 26-10
Characteristics of Roadways in Tehama County that are Main Access Routes to the Proposed Pump Installation Site at the Red Bluff Pumping Plant[a]

Roadway	Number of Lanes	Roadway Condition	Comments
I-5	4	Good[b]	Divided
Antelope Boulevard	4	Good	Has turning lanes
South Main Street	4	Good	Has turning lanes
Diamond Avenue	2	Good	

[a]The expected access route to the proposed pump installation site is as follows: from I-5 southbound, travel south on Diamond Avenue in Red Bluff. From I-5 northbound, travel west on Antelope Boulevard, south on South Main Street, and then south on Diamond Avenue in Red Bluff.

[b]Good roadway condition is defined as fully paved with very few cracks or potholes that result in desirable driving conditions.

Note:

I = Interstate Freeway

ADTs on the selected representative road segments are presented in Table 26-11.

Table 26-11
ADT for Selected Roads in Tehama County

Roadway	Segment	Year	ADT	Calculated 2010 ADT*
I-5	Glenn County Line to SR 36	2010	38,000	38,000
Diamond Avenue	South Main Street to end of road	2007	5,344	6,012

*Calculated volumes are based on four percent average annual growth rate (City of Red Bluff, 2011).

Notes:

ADT = Average Daily Traffic
I = Interstate Freeway
SR = State Route

Source: City of Red Bluff, 2011; Caltrans, 2009.

26.2.4 Primary Study Area

26.2.4.1 Navigation

The major waterway that flows through the Primary Study Area is the Sacramento River, which is regulated by Shasta Dam and is navigable year round. The river is 327 miles long and is considered a navigable river from its mouth to Keswick Dam, a distance of 301 miles.

The State of California, as covered by the California Constitution, allows for public access to waterways, further empowered by the public trust doctrine. Marine traffic within the Primary Study Area (which is located at the Delevan Pipeline Intake/Discharge Facilities) is recreational, and is limited to motorized and non-motorized watercraft for the purposes of fishing and boating.

Peak flows in the Sacramento River generally occur in the late winter months in Wet years and peak in July in the Dry years due to Shasta Dam releases. Flows during the recreation season (Memorial Day to Labor Day) do not vary a great deal across water year types. The river is navigable throughout the recreation season in all water year types, with flows at Bend Bridge and Red Bluff Diversion Dam ranging from approximately 6,000 cfs to 13,000 cfs.

26.2.4.2 Transportation and Traffic

Roadway Traffic Levels and Condition

The Glenn County roadways within the Primary Study Area are considered minor collectors, except Canal Road, which is considered a collector. All Colusa County roadways are considered minor collectors.

Table 26-12 describes the routes that are expected to be used to access Project facility sites during Project construction, operation, and maintenance. These routes include existing roads and new permanent roads to be constructed as part of the Project. Figure 3-1 in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives shows the locations of these roads relative to the Project facilities.

Table 26-12
Expected Roadway Access Routes to Project Facilities

Facility #	Project Feature	Access Route
1a	Sites Reservoir Inundation Area (northern area)	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and continue straight on North Road (new permanent)
1b	Sites Reservoir Inundation Area (central area)	• From I-5, travel west on Maxwell Sites Road
1c	Sites Reservoir Inundation Area (southern area)	• From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), and turn right on Huffmaster Road • From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), and turn right on Lurline Road (new permanent, detour during construction)
2a	Sites Dam	• From I-5, travel west on Maxwell Sites Road
2b	Golden Gate Dam	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on Eastside Road (new permanent), and turn right on new permanent O&M road • From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road, and turn left on new permanent O&M road
2c	Saddle Dams	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on North Road (new permanent) for Saddle Dams 7, 8, and 9, or turn left from North Road onto Saddle Dam Road (new permanent) for Saddle Dams 1, 2, 3, 4, and 5, or turn left from North Road onto new permanent O&M road for Saddle Dam 6, or turn left from County Road 69 onto Eastside Road (new permanent) and turn right on new permanent O&M road for the Golden Gate Saddle Dam • From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road and turn left on new permanent O&M road
3a 4a	Saddle Dam Recreation Area Saddle Dam Road	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on North Road (new permanent), and turn left on Saddle Dam Road (new permanent)
3b 4b	Lurline Headwaters Recreation Area Lurline Road	• From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), and turn right on Lurline Road (new permanent, detour during construction)

Table 26-12
Expected Roadway Access Routes to Project Facilities

Facility #	Project Feature	Access Route
3c	Antelope Island Recreation Area	• From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), turn right on Huffmaster Road, and turn left on new temporary construction road • From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), turn right on Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and turn left on new temporary construction road
3d 4c	Stone Corral Recreation Area Stone Corral Road	• From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road (new permanent), turn left on Stone Corral Road (new permanent), and turn left on Stone Corral Recreation Area Road (new permanent)
3e 4d	Peninsula Hills Recreation Area Peninsula Road	• From I-5, travel west on Maxwell Sites Road to Sites Lodoga Road, and turn right on Peninsula Road (new permanent campground spur road) • From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road (new permanent), turn left on Stone Corral Road (new permanent), across the South Bridge (new permanent) onto Sites Lodoga Road, and turn right on Peninsula Road (new permanent campground spur road)
4e	South Bridge	• From I-5, travel west on Maxwell Sites Road, and turn right on Peterson Road to reach central footings (this route is only available if the bridge is constructed before Sites Dam, which will block access on Maxwell Sites Road) • From I-5, travel west on Maxwell Sites Road and continue straight on Sites Lodoga Road to reach the western approach/footings • From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road (new permanent), and turn left on Stone Corral Road to reach the eastern approach/footings
4f	Com Road	• From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), and turn right on Lurline Road (new permanent, detour during construction), and turn right on Com Road (new permanent)
4g 5 6	Eastside Road Sites Pumping/Generating Plant Field Office Maintenance Yard	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on Eastside Road (new permanent) • From I-5, travel west on Maxwell Sites Road and turn right on Eastside Road (new permanent)
4h	Sulphur Gap Road	• From I-5, travel west on Maxwell Sites Road, and turn left on Sulphur Gap Road (new permanent)

Table 26-12
Expected Roadway Access Routes to Project Facilities

Facility #	Project Feature	Access Route
4i	North Road	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on North Road (new permanent) • From I-5, travel west on Maxwell Sites Road, and turn right on Eastside Road (new permanent) and follow to North Road
7 8	Holthouse Reservoir Complex Holthouse Reservoir Electrical Switchyard	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on Eastside Road (new permanent), turn left on access road on south side of Funks Reservoir • From I-5, travel west on Maxwell Sites Road and turn right on Eastside Road (new permanent), turn right on access road on south side of Funks Reservoir
9 10	Sites Electrical Switchyard Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on Eastside Road (new permanent), and turn left on new permanent O&M road • From I-5, travel west on Maxwell Sites Road, turn right on Eastside Road (new permanent), turn right on new permanent O&M road
11	Sites Reservoir Inlet/Outlet Structure	• From I-5, travel west on Maxwell Sites Road, turn left onto Sulphur Gap Road, to Lurline Road, to Huffmaster Road, to Peterson Road
12	GCID Canal Facilities Modifications Headgate Modifications Railroad Siphon Modifications	• From I-5, travel east on SR 32 and turn left on Canal Road • From I-5 northbound, exit County Road 53, immediately turn left onto SR 99, and proceed 1.1 miles north to the intersection with the GCID Canal. Turn right at GCID Canal; the railroad siphon is approximately 200 feet east of SR 99
13 14 15 16 17	GCID Canal Connection to the TRR TRR TRR Pumping/Generating Plant TRR Electrical Switchyard GCID Canal Connection to the TRR	• From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road
18 19 20	TRR Pipeline TRR Pipeline Road Delevan Pipeline Electrical Switchyard	• From I-5, travel west on Delevan Road, turn left on McDermott Road, turn right on temporary construction access road
21a 22a	Delevan Pipeline (western portion) Delevan Transmission Line (western portion)	• From I-5, travel west on Delevan Road, then turn left on Sutton Road, McDermott Road, or County Road D

Table 26-12
Expected Roadway Access Routes to Project Facilities

Facility #	Project Feature	Access Route
23 24 21b 22b	Delevan Pipeline Intake Facilities Delevan Pipeline Discharge Facility Delevan Pipeline (eastern portion) Delevan Transmission Line (eastern end)	• From I-5, travel east on Maxwell Road, and turn left on SR 45 • From I-5, travel east on SR 162, and turn right on SR 45
21c 22c	Delevan Pipeline (central portion) Delevan Transmission Line (central portion)	• From I-5, travel east on Maxwell Road, and turn left on Four Mile Road or Two Mile Road • From I-5, travel east on Delevan Road, and turn right on Four Mile Road or Two Mile Road
21d	Delevan Pipeline (far western portion)	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on Eastside Road (new permanent) • From I-5, travel west on Maxwell Sites Road, and turn right on Eastside Road (new permanent)
25	Borrow Areas (Generally Within the Reservoir Inundation Area or Adjacent on Logan Ridge)	• From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on Eastside Road (new permanent) • From I-5, travel west on Maxwell Sites Road, turn left on right on Eastside Road (new permanent) • From I-5, travel west on Maxwell Sites Road, turn left on Sulphur Gap Road (new permanent), turn right on Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and travel straight on Peterson Road • From I-5, travel west on Maxwell Sites Road

Notes:
I = Interstate Freeway
O&M = Operations and maintenance
SR = State Route

Glenn County

Ten roadways in Glenn County were identified as primary access roads to Project facility sites. The roadways and a summary of their observed characteristics are listed in Table 26-13.

Table 26-13
Characteristics of Roadways in Glenn County that are Main Access Routes to Project Facilities

Roadway	Project Facility # Accessed by Roadway[a]	Number of Lanes	Roadway Condition[b]	Comments
I-5	All Project facilities	4	Good	Divided Interstate
SR 32	12	2	Fair to Good	Through Orland, it is two paved lanes with a center lane and on-street parking in places; two paved lanes east of town with some visible cracks
County Road 68	1a, 2b, 2c, 3a, 4g, 4i, 5, 6, 7, 8, 9,	2	Poor to Good	Shoulders partially paved; some visible cracks

Table 26-13
Characteristics of Roadways in Glenn County that are Main Access Routes to Project Facilities

Roadway	Project Facility # Accessed by Roadway[a]	Number of Lanes	Roadway Condition[b]	Comments
	10, 21d, 25			
County Road 69	1a, 2b, 2c, 3a, 4g, 4i, 5, 6, 7, 8, 9, 10, 21d, 25	2	Fair to Good	
County Road D	1a, 2b, 2c, 3a, 4g, 4i, 5, 6, 7, 8, 9, 10, 21a, 21d, 22a, 25	2	Fair to Good	No shoulder at some locations
Canal Road	12	2	Good	No shoulders

[a]Refer to Table 26-12 for the Project facility name associated with each Project facility number.

[b]Roadway Condition: Good = Fully paved with very few cracks or potholes that result in desirable driving conditions.
Fair = Fully paved with some cracks or potholes that result less-than-desirable driving conditions.
Poor = Un-paved or paved with significant cracks and potholes that need to be avoided while driving and result in undesirable driving conditions.

Notes:

I = Interstate Freeway
SR = State Route

ADTs on selected representative road segments in Glenn County are presented in Table 26-14. Figure 3-1 in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives shows the locations of these roads relative to the Glenn County portion of the Project facility sites.

Table 26-14
2010 ADT for Selected Roads in Glenn County

Roadway	Segment	Year	ADT	Calculated 2010 ADT	2010 Level of Service[a]
I-5	Glenn/Colusa County Line to County Road 68	2008	25,000	26,523	C
I-5	County Road 16 to SR 32 E	2008	25,000	26,523	C
SR 32	I-5 to SR 45	2010	10,800	10,800	D
County Road 68	County Road F to I-5	2009	186	192	A
County Road 68	I-5 to County Line/Norman Road	2007	212	232	A
County Road 69	I-5 to County Road F	2011[b]	20	20	A
County Road D	Glenn/Colusa County Line to County Road 57	2009	390	402	A
Canal Road	SR 32 to end of road	2011[b]	1,900	1,740	B

[a]Refer to Tables 26-4 and 26-5 for the Level of Service criteria.

[b]2010 data are not available

Notes:

ADT = Average Daily Traffic
I = Interstate Freeway
SR = State Route

Source: Glenn County, 2011; Caltrans, 2009.

Colusa County

Fourteen roadways in Colusa County were identified as primary access roads to Project facility sites. The roadways and a summary of their observed characteristics are listed in Table 26-15. Figure 3-1 in Chapter 3 Description of the Proposed Project/Proposed Action and Alternatives shows the locations of these roads relative to the Colusa County portion of the Project facility sites.

The proposed Sites Reservoir would be located approximately 10 miles west of the town of Maxwell. Maxwell Sites Road would provide east-to-west access through that Project site. This road experiences higher traffic volumes than other local roadways in the area, particularly on weekends. Travelers use this road to access East Park Reservoir, the southwest portion of the Mendocino National Forest, and the communities of Stonyford and Lodoga (Calfed Bay-Delta Program, 2000).

Table 26-15
Characteristics of Roadways in Colusa County that are Main Access Routes to Project Facilities

Roadway	Project Facility # Accessed by Roadway[a]	Number of Lanes	Roadway Condition[b]	Comments
I-5	All Project facilities	4	Good	Divided interstate highway.
SR 45 (Colusa County only)	16, 17, 21b, 22b	2	Fair to Good	25 mph to 55 mph posted speed limit; unpaved shoulders at some locations.
SR 162	16, 17, 21b, 22b	2	Fair to Good	Through Willows, it is four paved lanes with a center lane; two paved lanes east of town with some visible cracks (some sealed, some not sealed)
Maxwell Sites Road	1b, 1c, 2a, 2b, 3b, 3c, 3d, 3e, 4b, 4c, 4d, 4e, 4f, 4g, 4h, 4i, 5, 6, 7, 8, 9, 10, 11, 21b, 21c, 22b, 22c, 23, 24, 25	2	Fair to Good	Narrow shoulders east of Maxwell. Unpaved or no shoulders west of Mills Orchard; 35 mph posted speed limit.
Huffmaster Road	1c, 3c, 11, 25	1½	Poor to Fair	From Maxwell Sites Road intersection south 0.2 mile, the road is cracked, potholed pavement; gravel road south of that point.
Sites Lodoga Road	3e, 4e	2	Poor to Good	Shoulders sometimes absent; 25 mph posted speed limit east of Lodoga Stonyford Road.
Delevan Road	13, 14, 15, 16, 17, 18, 19, 20, 21a, 21c, 22a, 22c	2	Good and Poor to Fair	Paved shoulders are narrow near the canal, and east of Old Hwy 99. Some areas are depressed; some potholes, cracking, and patching. New pavement west of I-5 to McDermott Road. Dirt and below grade west of McDermott Road (possibly being prepared for paving).
Noel Evan Road	13, 14, 15, 16, 17	1	Poor	A gravel canal road.
Sutton Road	21a, 22a	1½ to 2	Poor and Fair to Good	North of Delevan Road: gravel 1½-lane road (poor condition); south of Delevan Road: paved two-lane road with no shoulders (fair to good condition)
Four Mile Road	21c, 22c	2	Poor to Fair	Dirt and gravel road south of Delevan Road and north of Maxwell Road.

Table 26-15
Characteristics of Roadways in Colusa County that are Main Access Routes to Project Facilities

Roadway	Project Facility # Accessed by Roadway[a]	Number of Lanes	Roadway Condition[b]	Comments
Two Mile Road	21c, 22c	2	Poor to Fair	Dirt and gravel road south of Delevan Road and north of Maxwell Road.
Maxwell Road	21b, 21c, 22b, 22c, 23, 24	2	Poor to Good	Narrow shoulders; 35 mph posted speed limit.
McDermott Road	13, 14, 15, 16, 17, 21a, 22a	2	Fair to Good	Narrow or no shoulder. Some patching, some cracking. New pavement north of Delevan Road. Gravel north of Dirks Road.
Peterson Road	4e, 11, 25	2	Poor	Unpaved; dirt and gravel road wide enough for two cars.

[a]Refer to Table 26-12 for the Project facility name associated with each Project facility number.

[b]Roadway Condition: Good = Fully paved with very few cracks or potholes that result in desirable driving conditions.
Fair = Fully paved with some cracks or potholes that result less-than-desirable driving conditions.
Poor = Un-paved or paved with significant cracks and potholes that need to be avoided while driving and result in undesirable driving conditions.

Notes:

I = Interstate Freeway
mph = miles per hour
SR = State Route

ADTs on the selected representative road segments are presented in Table 26-16.

Table 26-16
2010 ADT for Selected Roads in Colusa County

Roadway	Segment	Year	Daily Traffic Volumes	Calculated 2010 ADT	2010 Level of Service[a]
I-5	SR 20 to Maxwell Colusa Road	2008	24,700	25,698	C
I-5	Delevan Road to Glenn/Colusa County Line	2008	25,000	26,010	C
SR 45	Maxwell Colusa Road to County Road P29	2008	2,100	2,185	B
SR 45	County Road P29 to Glenn/Colusa County Line	2008	2,300	2,393	B
SR 162	County Road D to SR 45	2010	8,800	8,800	D
Maxwell Sites Road	I-5 to Sutton Road	2000	1,486	1,812	B
Maxwell Sites Road	GCID Canal to Sites Lodoga Road	2000	618	754	A
Huffmaster Road	Beginning of road to end of road	N/A	N/A	N/A	N/A
Sites Lodoga Road	Maxwell Sites Road to Leesville Lodoga Road	2000	360	439	A
Delevan Road	Four Mile Road to GCID Canal	1994	364	500	A
Noel Evan Road[b]	South from gravel portion of Delevan Road	N/A	N/A	N/A	N/A
Sutton Road	Maxwell Sites Road to Delevan Road	2010	234	234	A
Excelsior Road/Four Mile	Maxwell Road to Delevan Road	2003	44	51	A

Table 26-16
2010 ADT for Selected Roads in Colusa County

Roadway	Segment	Year	Daily Traffic Volumes	Calculated 2010 ADT	2010 Level of Service[a]
Road					
Pole Line Road/Two Mile Road	Delevan Road to Maxwell Colusa Road	2003	76	88	A
Maxwell Road	I-5 to SR 45	2007	2,389	2,535	B
McDermott Road	Maxwell Sites Road to Lenahan Road	1994	265	364	A
Peterson Road[b]	Beginning of road to end of road	N/A	N/A	N/A	N/A

[a]Refer to Tables 26-4 and 26-5 for the Level of Service criteria.

[b]This road provides access to a Project facility site, but because no data are available, it is not included in the impact analysis (N/A).

Notes:
ADT = Average Daily Traffic
I = Interstate Freeway
SR = State Route

Source: Colusa County, 2011; Caltrans, 2009 and 2010.

Transit System

Glenn County

The Glenn Transit Service is the public transit operator for Glenn County, administered by the Glenn County Department of Public Works. It offers four types of public transportation services (Nelson/Nyygard, 2008):

- **Glenn Ride** is the only general fixed-route inter-city transit service in the county, connecting Willows, Artois, Orland, and Hamilton City, as well as Chico in Butte County. Seven trips are provided during the weekdays and three trips are provided on Saturday. No service is provided on Sundays.
- **Glenn Transport (Dial-a-Ride)** is available to senior residents who meet particular eligibility requirements and are unable to use the Glenn Ride bus system. Services are restricted to within a 1.5-mile radius of the City Halls of Orland and Willows, the Leisure Mobile Home Park, the Willows-Glenn Mobile Home Park, and the Huggins/Cannell Drives area. The service operates from 7:30 a.m. to 6:00 p.m. on weekdays and from 9:00 a.m. to 4:00 p.m. on Saturdays.
- **Volunteer Medical Transport** provides transportation service to medical appointments for Glenn County residents who are unable to use Glenn Ride and do not have a personal mode of transportation. Volunteers use their personal vehicles to transport the patients.
- **CalWORKs "Ride to Work"** offers a van service to eligible CalWORKs workers referred by Glenn County Human Resource Agency. Transportation is provided to and from work opportunities.

Colusa County

Nine vehicles comprise the Colusa County Transit services. The services include:

- Five routes operated on a fixed route and schedule. Pick-ups are arranged on a dial-a-ride basis, with door-to-door service available for ADA passengers.
- Out-of-county medical transportation service provided to Chico, Davis, Lincoln, Marysville, Oroville, Roseville, Sacramento, Willows, Woodland, and Yuba City.
- Trips to/from Yuba City provided on Fridays (bus departs Colusa at 9:30 a.m. and departs Yuba City at 1:30 p.m.).
- Charter trips can be arranged using the available fleet if it does not interfere with regularly scheduled service.

Rail Traffic

Railway Facilities and Operations

The West Valley Line of the California Northern Railroad (CFNR) is located east of the town of Sites, and operates between Davis and Tehama, California. The major commodities carried by CFNR include tomato products, olives, rice, cheese, frozen foods, beer, wine, and wheat, as well as stone, petroleum products, and chemicals. The CFNR does not provide passenger service.

Air Traffic

Air Facilities and Operations

The airfield nearest to the town of Sites is Moller Airport located approximately eight miles to the east, outside of Maxwell, California. There are eight single engine aircraft based at Moller Airport. Other nearby airports include Colusa County Airport, Gunnersfield Ranch Airport, Antelope Valley Ranch Airport, and Willows-Glenn County Airport.

26.3 Environmental Impacts/Environmental Consequences

26.3.1 Regulatory Setting

Navigable waterways and transportation/traffic are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

26.3.1.1 Federal Plans, Policies, and Regulations

- National Environmental Policy Act (NEPA) of 1969
- Rivers and Harbors Act of 1899, Section 10

26.3.1.2 State Plans, Policies, and Regulations

- California Environmental Quality Act (CEQA) of 1970
- California Department of Transportation (Caltrans) regulatory authority over the California State highway system

26.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

26.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* does not include significance criteria for navigation, and suggests the following evaluation criteria for transportation and traffic:

Would the Project:

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?
- Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
- Result in inadequate emergency access?
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Conflict with navigation along navigable waterways.
- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflict with an applicable congestion management program, including, but not limited to, Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.

- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Result in inadequate emergency access.
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Within the Primary Study Area, Level of Service D was considered the significance threshold for Caltrans roadways and Level of Service C was considered the significance threshold for Glenn and Colusa County roadways.

26.3.3 Impact Assessment Assumptions and Methodology

26.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to navigation, transportation, and traffic:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.

26.3.3.2 Methodology

Navigation

When considering Project construction impacts on the navigability of the Sacramento River, a review was conducted of the construction activities and equipment that would be required to construct the Delevan

Pipeline Intake Facilities and the Delevan Pipeline Discharge Facility. Data regarding the number and types of equipment that would be required to construct, operate, and maintain Project facilities were developed by Project engineers.

When considering Project operation impacts on the navigability of the Sacramento River, the proposed diversion and release amounts and velocities were considered.

Transportation

Most transportation impacts are not measured quantitatively, but rather relatively. For the analysis of these impacts, the No Project/No Action Alternative and the action alternatives were compared to Existing Conditions, and impacts were determined based on the criteria defined in Section 26.3.2. Traffic operations impacts were measured quantitatively. Project construction-, operations-, and maintenance-related vehicle trips were added to existing roadways volumes, using data regarding the number and types of equipment and vehicles that would be required to construct, operate, and maintain Project facilities (data were developed by Project engineers).

The roadway volume to capacity ratio was then calculated and the associated Level of Service was determined. The Level of Service from the No Project/No Action Alternative and the action alternatives was then compared to Existing Conditions, and impacts were determined based on the defined criteria (Section 26.3.2) and mobility thresholds, as defined by the transportation facilities' governing agency (Section 26.2.1.2).

For analysis purposes, the peak construction period for each Project facility within each alternative was assumed to overlap. Although the overlap of certain construction phases may not be feasible, this approach accounts for unforeseen schedule changes and provides a conservative analysis. Of the Project construction-related trips, construction worker trips would comprise the majority. Construction workers were assumed to commute to construction sites from regional population centers, including Maxwell, Willows, Orland, Williams, Colusa, and from other northern California counties when specialty trades or skillsets are not available regionally. The number of construction workers required during peak construction of Project facilities varies by alternative, resulting in different trip distributions for each alternative.

To determine impacts to traffic on the local roads, the estimated visitation to Sites Reservoir and its Recreation Areas (developed by Project Economists) was used to estimate the potential distribution of recreation traffic on local roads. The traffic estimate considered a May to September recreation season (with fewer recreationists traveling there October to April – a 70/30 percent split) and a March to November recreation season (with fewer recreationists traveling there December to February – a 95/5 percent split). The traffic estimate also considered more recreation traffic Friday through Sunday than during other week days, as well as 2.6 persons per vehicle.

26.3.4 Topics Eliminated from Further Analytical Consideration

26.3.4.1 Navigation

San Luis Reservoir is not a navigable waterway, so it is not addressed in the analysis for the Extended Study Area. In addition, none of the creeks, bypasses, and reservoirs that are included in the Secondary Study Area are navigable waterways, so they are not addressed in this analysis.

The navigation discussion for the Primary Study Area focuses on the Delevan Pipeline Intake Facilities (Alternatives A and C) and the Delevan Pipeline Discharge Facility (Alternative B) because they are the only proposed facilities that could result in impacts to navigation. The other Project facilities that are proposed within the Primary Study Area are, therefore, not addressed in this analysis.

26.3.4.2 Transportation and Traffic

None of the identified airports (Moller Airport, Colusa County Airport, Gunnersfield Ranch Airport, Antelope Valley Ranch Airport, and Willows-Glenn County Airport) are located near the Project facility sites; therefore, Project construction and operation would not affect air traffic patterns. For this reason, air traffic patterns are not discussed in this analysis.

The transportation and traffic discussion for the Secondary Study Area focuses on the pump installation at the Red Bluff Pumping Plant because this is the only location within that study area where construction and maintenance activities would occur that could result in impacts to transportation and traffic. Operational changes within the waterways of the Secondary Study Area would not affect traffic or transportation, and are, therefore, not addressed in this analysis.

26.3.5 Impacts Associated with the No Project/No Action Alternative

26.3.5.1 Navigation

Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, Trinity River, Klamath River downstream of the Trinity River, Sacramento River, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and Pump Installation at the Red Bluff Pumping Plant

Impact Nav-1: Conflict with Navigation along Navigable Waterways

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to navigation has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on navigation when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to cause increased use of navigable waterways throughout the State, both for commerce and recreational purposes. Navigation impacts that could potentially occur as a result of the increased population would be managed by USDOT for issues related to interstate marine traffic, and local navigation issues would be managed at the local level in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions

Projects considered within the No Project/No Action Alternative are not located within the Primary Study Area and **would, therefore, not have a substantial adverse effect** on navigation within that study area, when compared to Existing Conditions. In addition, if the No Project/No Action Alternative is implemented, no new Project-related construction would occur within any of the three study areas. Therefore, **there would not be a substantial adverse effect** on navigation in existing waterways within the Extended, Secondary, or Primary study areas, when compared to Existing Conditions**.**

26.3.5.2 Transportation and Traffic

Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, and Pump Installation at the Red Bluff Pumping Plant

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

If the No Project/No Action Alternative is implemented, Project-related construction would not occur and the Project would not be completed. In addition, other projects and programs included in the No Project/No Action Alternative would occur as planned, but would not result in a conflict with plans, ordinances, or policies regarding the transportation systems within the three study areas that has not already been addressed in environmental documents that have been prepared, pursuant to CEQA and NEPA, addressing those projects. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions

Population growth that is expected to occur in California throughout the period of Project analysis is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to result in increased traffic levels, which have been anticipated in local general plans and regional transportation plans and policies. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Impact Trans-2: Conflict with an Applicable Congestion Management Program, Including, but not Limited to, Level of Service Standards and Travel Demand Measures, or Other Standards Established by the County Congestion Management Agency for Designated Roads or Highways

Refer to the **Impact Trans-1** discussion. For those same reasons, implementation of the No Project/No Action Alternative would not conflict with congestion management programs, Level of Service standards, travel demand measures, or other transportation standards within the Extended, Secondary, or Primary study areas. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions

Impact Trans-3: Substantially Increase Hazards Due to a Design Feature or Incompatible Uses

Refer to the **Impact Trans-1** discussion. For those same reasons, implementation of the No Project/No Action Alternative would not affect existing roadway hazards, such as curved alignments or dangerous intersections that may exist within the Extended, Secondary, or Primary study areas. In addition, there would be no potential conflicts between vehicles and farm equipment on roads within the Extended, Secondary, or Primary study areas. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions

Impact Trans-4: Result in Inadequate Emergency Access

Refer to the **Impact Trans-1** discussion. For those same reasons, implementation of the No Project/No Action Alternative would not affect existing emergency access to and from properties located within the Extended, Secondary, or Primary study areas. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Trans-5: Conflict with Adopted Policies, Plans, or Programs Regarding Public Transit, Bicycle, or Pedestrian Facilities, or Otherwise Decrease the Performance or Safety of Such Facilities

Refer to the **Impact Trans-1** discussion. For those same reasons, implementation of the No Project/No Action Alternative would not conflict with adopted public transit, bicycle, or pedestrian facility policies, plans, or programs that are currently in effect within the Extended, Secondary, or Primary study areas. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions**.**

26.3.6 Impacts Associated with Alternative A

26.3.6.1 Navigation

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, and Wildlife Refuge Water Use

Impact Nav-1: Conflict with Navigation along Navigable Waterways

Because there would be no direct Project construction or maintenance occurring in the Extended Study Area, there would be no interruption of marine traffic on the navigable waterways within that study area. Implementation of Alternative A would result in increased water supply reliability to agricultural, municipal, and industrial water users, and the provision of an alternate Level 4 wildlife refuge water supply. These operational changes would not result in interruption of marine traffic on the navigable waterways within the Extended Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity River, Klamath River downstream of the Trinity River, Sacramento River, Feather River, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and Pump Installation at the Red Bluff Pumping Plant

Impact Nav-1: Conflict with Navigation along Navigable Waterways

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant on the Sacramento River. This construction activity would not affect the navigational channel of the Sacramento River, and therefore, is not expected to result in interruption of marine traffic along that portion of the Sacramento River. The only direct Project-related maintenance activity that would occur is the removal and disposal of sediment from the existing GCID Canal Intake and the Red Bluff Pumping Plant. This activity is expected to occur within the footprint of the Project facilities, and is not expected to affect the navigational channel of the Sacramento River. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of Alternative A would result in operational changes to the navigable waterways included in the Secondary Study Area. However, these operational changes would fall within the historical range of operation of these waterbodies, resulting in **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Delevan Pipeline Intake Facilities

Impact Nav-1: Conflict with Navigation along Navigable Waterways

The cofferdam that would be installed to dewater the Project facility's construction site would extend into the river approximately 40 feet from the river bank, compared to a low-flow river channel width of 240 feet. The navigational channel of the Sacramento River would, therefore, be narrowed during the construction of the Delevan Pipeline Intake Facilities, but would not substantially affect the navigability of the Sacramento River at that location. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The existing Maxwell ID Pumping Plant, located immediately upstream of the proposed Delevan Pipeline Intake location, is located in a narrow section of the river and consequently acts as a local flow control point (Reclamation, 2012). Therefore, following construction, the Delevan Pipeline Intake Facilities would not alter the flow of the river. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Alternative A operations are not expected to alter the navigable channel of the Sacramento River. Operation of the proposed Delevan Pipeline Intake Facilities is expected to follow flow regime criteria that are set forth by the resource agencies, and as such, would maintain sufficient flow to not adversely affect marine traffic. In addition, at low flow of 6,000 cfs in the river, the proposed fish screen would extend approximately 40 feet into the 240-feet-wide river channel, which would allow for recreational boat traffic to pass the fish screen structure. Therefore, there would be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

26.3.6.2 Transportation and Traffic

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

Because there would be no direct Project construction- or maintenance-related vehicle trips occurring in the Extended Study Area, there would be no conflict with plans, ordinances, or policies regarding the transportation systems within the Extended Study Area. Implementation of Alternative A would result in slight operational changes to San Luis Reservoir, increased water supply reliability to agricultural, municipal, and industrial water users, and the provision of an alternate Level 4 wildlife refuge water supply. These operational changes would not be expected to result in changes to traffic levels. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-2: Conflict with an Applicable Congestion Management Program, Including, but not Limited to, Level of Service Standards and Travel Demand Measures, or Other Standards Established by the County Congestion Management Agency for Designated Roads or Highways

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no conflict with congestion management program standards or measures within the Extended Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-3: Substantially Increase Hazards Due to a Design Feature or Incompatible Uses

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no increase in hazards due to a design feature or incompatible use within the Extended Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-4: Result in Inadequate Emergency Access

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no change in emergency access. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-5: Conflict with Adopted Policies, Plans, or Programs Regarding Public Transit, Bicycle, or Pedestrian Facilities, or Otherwise Decrease the Performance or Safety of Such Facilities

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Pump Installation at the Red Bluff Pumping Plant

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant. The only direct Project-related maintenance activity that would occur is the removal of sediment from the existing canal intakes. Neither of these Project-related activities in the Secondary Study Area is expected to result in conflicts with transportation circulation system plans, ordinances, or policies due to the low number of vehicle trips associated with these activities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-2: Conflict with an Applicable Congestion Management Program, Including, but not Limited to, Level of Service Standards and Travel Demand Measures, or Other Standards Established by the County Congestion Management Agency for Designated Roads or Highways

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no conflict with congestion management program standards or measures within the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-3: Substantially Increase Hazards Due to a Design Feature or Incompatible Uses

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no increase in hazards due to a design feature or incompatible use within the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-4: Result in Inadequate Emergency Access

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no change in emergency access. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-5: Conflict with Adopted Policies, Plans, or Programs Regarding Public Transit, Bicycle, or Pedestrian Facilities, or Otherwise Decrease the Performance or Safety of Such Facilities

Refer to the **Impact Trans-1** discussion. For those same reasons, there would be no conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Within the Primary Study Area, Project construction-related vehicle trips would occur on numerous roadways for the duration of the Project construction period. The Level of Service for the roadways leading to the proposed Project facilities prior to and during construction is presented in Table 26-17.

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

All roadways would continue to operate at an acceptable Level of Service during Project construction. Traffic levels on roadways would increase during Project construction, particularly before construction activities start and after they end each day, and would result in an increase in traffic congestion. The Level of Service on County Road 68 between County Road F and I-5, County Road 69 between I-5 and County Road F, County Road D between the Glenn/Colusa County Line and County Road 57, Maxwell Sites Road between the GCID Canal and Sites Lodoga Road, and Delevan Road between Four Mile Road and the GCID Canal would change from Level of Service A to Level of Service B. This increase in vehicle traffic and congestion would result in a **less-than-significant impact** because the Level of Service criteria for County roadways would not be exceeded, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation- and maintenance-related traffic would use the same roads that were used for Project construction but would require 60 total vehicles trips per day throughout the Primary Study Area, which would not impact the roadway Level of Service. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, due to the low number of vehicle trips associated with Project operation and maintenance.

During Project operation, recreational traffic would use I-5, County Road 68, County Road D, County Road 69, Maxwell Sites Road, Huffmaster Road, and new Project roads to access Sites Reservoir and its Recreation Areas. Recreational traffic levels on roads leading to these Project facilities are expected to increase from existing levels because recreationists are likely to want to visit the new reservoir to see what it offers. The expected increase in traffic on these roads could cause an associated temporary or even permanent reduction in recreation traffic on roads leading to other regional reservoirs (i.e., those located in the Secondary Study Area).

Table 26-17
2010 and Alternative A Construction Level Of Service

Roadway	Segment	Calculated 2010 ADT	2010 Level of Service*	ADT with Peak Construction Trips	Peak Construction Level of Service
Glenn County Roadways					
I-5	Glenn/Colusa County Line to County Road 68	26,523	C	27,938	C
I-5	County Road 16 to SR 32 E	26,523	C	27,432	C
SR 32	I-5 to SR 45	10,800	D	10,868	D
County Road 68	County Road F to I-5	192	A	1,409	B
County Road 68	I-5 to County Line/Norman Road	232	A	300	A
County Road 69	I-5 to County Road F	20	A	1,237	B
County Road D	Glenn/Colusa County Line to County Road 57	402	A	1,599	B
Canal Road	SR 32 to end of road	1,740	B	2,094	B
Colusa County Roadways					
I-5	SR 20 to Maxwell Colusa Road	25,698	C	26,607	C
I-5	Delevan Road to Glenn/Colusa County Line	26,010	C	27,409	C
SR 45	Maxwell Colusa Road to County Road P29	2,185	B	2,471	B
SR 45	County Road P29 to Glenn/Colusa County Line	2,393	B	2,679	B
SR 162	County Road D to SR 45	8,800	D	9,086	D
Maxwell Sites Road	I-5 to Sutton Road	1,812	B	2,961	B
Maxwell Sites Road	GCID Canal to Sites Lodoga Road	754	A	1,903	B
Huffmaster Road	Beginning of road to end of road	N/A	N/A	519	A

Table 26-17
2010 and Alternative A Construction Level Of Service

Roadway	Segment	Calculated 2010 ADT	2010 Level of Service*	ADT with Peak Construction Trips	Peak Construction Level of Service
Sites Lodoga Road	Maxwell Sites Road to Leesville Lodoga Road	439	A	868	A
Delevan Road	Four Mile Road to GCID Canal	500	A	1,016	B
Sutton Road	Maxwell Sites Road to Delevan Road	234	A	414	A
Excelsior Road/Four Mile Road	Maxwell Road to Delevan Road	51	A	231	A
Pole Line Road/Two Mile Road	Delevan Road to Maxwell Colusa Road	88	A	268	A
Maxwell Road	I-5 to SR 45	2,535	B	2,821	B
McDermott Road	Maxwell Sites Road to Lenahan Road	364	A	880	A

*Refer to Tables 26-4 and 26-5 for the Level of Service criteria.

Notes:

ADT = Average Daily Traffic
I = Interstate Freeway
N/A = not available
SR = State Route

Source: Colusa County, 2011; Caltrans, 2009 and 2010.

Recreational traffic levels on roads leading to these Project facilities are expected to increase from existing levels because recreationists are likely to want to visit the new reservoir to see what it offers. The expected increase in traffic on these roads could cause an associated temporary reduction in recreation traffic on roads leading to other regional reservoirs (i.e., those located in the Secondary Study Area).

Recreation visitor days (RVDs) have been estimated by Project Economists for Alternative A at 360,975 per year[1] (Pavich, 2012). Maxwell Sites Road is expected to have traffic levels that would result in Level of Service D during the Friday through Sunday period during the recreation season (either the March to November or May to September recreation season). I-5 would have Level of Service A or B. County Roads 68, 69, and D are expected to have traffic levels that would result in Level of Service E during the Friday through Sunday period of a March to November recreation season, or a Level of Service that is worse than F during the Friday through Sunday period of a May to September recreation season. This increase would result in a **significant impact** on the Level of Service of County roads listed above, and a **less-than-significant impact** on I-5's Level of Service, when compared to Existing Conditions and the No Project/No Action Alternative.

[1] An RVD is defined as a recreation visit by one person for part or all of one day.

Impact Trans-2: Conflict with an Applicable Congestion Management Program, Including, but not Limited to, Level of Service Standards and Travel Demand Measures, or Other Standards Established by the County Congestion Management Agency for Designated Roads or Highways

Within the Primary Study Area there are no Congestion Management Programs or County Congestion Management Agencies. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-3: Substantially Increase Hazards Due to a Design Feature or Incompatible Uses

All Project construction of roadways and bridges within the Primary Study Area would adhere to the appropriate city, county, and State design standards, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During construction, the use of construction equipment, such as oversize or overweight vehicles, on roadways near Project facility sites could result in unsafe conditions or damage to road surfaces. This would result in a **potentially significant impact** due to roadway hazards and damage associated with oversize and overweight loads, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation- and maintenance-related traffic would not cause damage to road surfaces or unsafe conditions. Therefore, there would be **no impact** during Project operations and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-4: Result in Inadequate Emergency Access

During construction of all Project facilities, the temporary closure of lanes and various roadways would likely occur. Construction of Sites Reservoir and Sites Dam has the potential to cause short-term effects to emergency services access response times by eliminating a portion of Maxwell Sites Road and Sites Lodoga Road, which provide access to both sides of the reservoir. However, the South Bridge would be constructed and operating before the portions of these roads are demolished and removed. The new route that includes the South Bridge would be approximately two miles longer than the existing route. Access to the west side of the proposed Sites Reservoir from the east side during construction of the South Bridge would be via the existing Maxwell Sites and Sites Lodoga roads (i.e., no change from the existing route). Access to the southern portion of Sites Reservoir during the construction of the South Bridge would be via the existing Huffmaster Road (also no change from the existing route). Sulphur Gap Road would be constructed prior to the demolition and removal of the portion of Huffmaster Road that crosses the proposed Sites Reservoir footprint. This and other Project construction activities may affect emergency access to properties near Project construction sites. This would result in a **less-than-significant impact** during Project construction, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operations and maintenance, adequate emergency access would be maintained. Therefore, there would be **no impact** during Project operation and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Trans-5: Conflict with Adopted Policies, Plans, or Programs Regarding Public Transit, Bicycle, or Pedestrian Facilities, or Otherwise Decrease the Performance or Safety of Such Facilities

Construction of Sites Reservoir and Sites Dam has the potential to cause short-term disruptions to public school bus service by eliminating a portion of Maxwell Sites Road and Sites Lodoga Road, which are part of a bus route for the Maxwell Unified School District. However, the South Bridge would be constructed and operating before the portions of these roads are demolished and removed. Bus service would then be provided via the South Bridge, which would be approximately two miles longer than the existing route. This would, therefore, result in a **less-than-significant** impact during Project construction and operations, when compared to Existing Conditions and the No Project/No Action Alternative. No other conflicts with policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities would occur with the Project.

During Project maintenance, no conflicts with policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities would occur. Therefore, there would be **no impact** during Project maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

26.3.7 Impacts Associated with Alternative B

26.3.7.1 Navigation

Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to navigable waterways (**Impact Nav-1**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

Delevan Pipeline Discharge Facility

Impact Nav-1: Conflict with Navigation along Navigable Waterways

The navigational channel of the Sacramento River would be narrowed slightly during the construction of the Delevan Pipeline Discharge Facility, but would not substantially affect the navigability of the Sacramento River at that location. The cofferdam that would be installed to dewater the Project facility's construction site would extend into the river approximately 5 to 10 feet from the river bank, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Alternative B operations are not expected to alter the navigable channel of the Sacramento River. Operation of the proposed Delevan Pipeline Discharge Facility is expected to follow criteria that are set forth by the resource agencies, and as such, releases would be such that they would not adversely affect marine traffic. In addition, the small size of this proposed facility would allow for recreational boat traffic to pass. Therefore, there would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

26.3.7.2 Transportation and Traffic

Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to circulation system performance (**Impact Trans-1**), congestion management programs (**Impact Trans-2**), design feature hazards or incompatible uses (**Impact Trans-3**), emergency access (**Impact Trans-4**), and adopted transportation policies, plans, or programs (**Impact Trans-5**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to transportation and traffic:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprints and construction disturbance areas of Sites Reservoir and Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities (that are included in Alternative A) would be replaced by the Delevan Pipeline Discharge Facility in Alternative B. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on congestion management programs (**Impact Trans-2**), design feature hazards or incompatible uses (**Impact Trans-3**), emergency access (**Impact Trans-4**), and adopted transportation policies, plans, or programs (**Impact Trans-5**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on congestion management programs (**Impact Trans-2**), design feature hazards or incompatible uses (**Impact Trans-3**), emergency access (**Impact Trans-4**), and adopted transportation policies, plans, or programs (**Impact Trans-5**) as described for Alternative A.

The changes to facility footprints and construction disturbance areas would, however, result in a different number of ADT with peak construction trips, with an associated change in Level of Service. The changes associated with implementation of Alternative B, as related to **Impact Trans-1**, are described below.

All Primary Study Area Project Facilities

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

When compared to Alternative A, Alternative B would not have construction trips along I-5, SR 162, SR 45, Canal Road, and Maxwell Road related to the Delevan Pipeline Intake Facilities, but would have construction trips along the same roads related to the Delevan Pipeline Discharge Facility. Alternative B would also result in an increase in construction trips along I-5, County Road 68, County Road D, County Road 69, Maxwell Sites Road, and Sites Lodoga Road related to the construction of the larger Sites Reservoir. In addition, the Road Relocations associated with this alternative would differ slightly from Alternative A and the Delevan Transmission Line would be shorter for Alternative B than for Alternative A. The roadway Level of Service for each Project facility prior to and during construction is presented in Table 26-18.

Table 26-18
2010 and Alternative B Construction Level Of Service

Roadway	Segment	Calculated 2010 ADT	2010 Level of Service*	ADT with Peak Construction Trips	Peak Construction Level of Service
Glenn County Roadways					
I-5	Glenn/Colusa County Line to County Road 68	26,523	C	28,043	C
I-5	County Road 16 to SR 32 E	26,523	C	27,431	C
SR 32	I-5 to SR 45	10,800	D	10,868	D
County Road 68	County Road F to I-5	192	A	1,620	B
County Road 68	I-5 to County Line/Norman Road	232	A	300	A
County Road 69	I-5 to County Road F	20	A	1,448	B
County Road D	Glenn/Colusa County Line to County Road 57	402	A	1,810	B
Canal Road	SR 32 to end of road	1,740	B	1,988	B
Colusa County Roadways					
I-5	SR 20 to Maxwell Colusa Road	25,698	C	26,606	C
I-5	Delevan Road to Glenn/Colusa County Line	26,010	C	27,620	C

Table 26-18
2010 and Alternative B Construction Level Of Service

Roadway	Segment	Calculated 2010 ADT	2010 Level of Service*	ADT with Peak Construction Trips	Peak Construction Level of Service
SR 45	Maxwell Colusa Road to County Road P29	2,185	B	2,365	B
SR 45	County Road P29 to Glenn/Colusa County Line	2,393	B	2,573	B
SR 162	County Road D to SR 45	8,800	D	8,980	D
Maxwell Sites Road	I-5 to Sutton Road	1,812	B	3,172	C
Maxwell Sites Road	GCID Canal to Sites Lodoga Road	754	A	2,114	B
Huffmaster Road	Beginning of road to end of road	N/A	N/A	730	A
Sites Lodoga Road	Maxwell Sites Road to Leesville Lodoga Road	439	A	1,079	B
Delevan Road	Four Mile Road to GCID Canal	500	A	1,016	B
Sutton Road	Maxwell Sites Road to Delevan Road	234	A	414	A
Excelsior Road/Four Mile Road	Maxwell Road to Delevan Road	51	A	231	A
Pole Line Road/Two Mile Road	Delevan Road to Maxwell Colusa Road	88	A	268	A
Maxwell Road	I-5 to SR 45	2,535	B	2,715	B
McDermott Road	Maxwell Sites Road to Lenahan Road	364	A	880	A

*Refer to Tables 26-4 and 26-5 for the Level of Service criteria.

Notes:

ADT = Average Daily Traffic
I = Interstate Freeway
SR = State Route

Source: Colusa County, 2011; Caltrans, 2009 and 2010.

All roadways would continue to operate at an acceptable Level of Service. Traffic levels on roadways would increase during Project construction, particularly before construction activities start and after they end each day, and would result in an increase in traffic congestion. The Level of Service on County Road 68 between County Road F and I-5, County Road 69 between I-5 and County Road F, County Road D between the Glenn/Colusa County Line and County Road 57, Maxwell Sites Road between I-5 and Sutton Road and between the GCID Canal and Sites Lodoga Road, Sites Lodoga Road between Maxwell Sites Road and Leesville Lodoga Road, and Delevan Road between Four Mile Road and the GCID Canal would change Level of Service, but would still meet the County roadway criteria of Level of Service C or better. Therefore, this increase in Project construction-related vehicle traffic and congestion would result in a **less-than-significant impact** because Level of Service criteria would not be exceeded, when compared to Existing Conditions and the No Project/No Action Alternative.

Traffic levels associated with Project operations and maintenance would increase, when compared to Existing Conditions and the No Project/No Action Alternative. Project operation- and maintenance-related traffic would use the same roads that were used for Project construction but would require 60 total vehicles trips per day throughout the Primary Study Area, which would not impact the roadway Level of Service. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, due to the low number of vehicle trips associated with Project operations and maintenance.

RVDs have been estimated by Project Economists for Alternative B at 358,049 per year (Pavich, 2012). Maxwell Sites Road is expected to have traffic levels that would result in Level of Service D during the Friday through Sunday period during the recreation season (either the March to November or May to September recreation season). I-5 would have Level of Service A or B. County Roads 68, 69, and D are expected to have traffic levels that would result in Level of Service E during the Friday through Sunday period of a March to November recreation season, or a Level of Service that is worse than F during the Friday through Sunday period of a May to September recreation season. This increase would result in a **significant impact** on the Level of Service of County roads listed above, and a **less-than-significant impact** on I-5's Level of Service, when compared to Existing Conditions and the No Project/No Action Alternative.

26.3.8 Impacts Associated with Alternative C

26.3.8.1 Navigation

Extended, Secondary, and Primary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to navigable waterways (**Impact Nav-1**), would be the same as described for Alternative A for the Extended, Secondary, and Primary study areas.

26.3.8.2 Transportation and Traffic

Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to circulation system performance (**Impact Trans-1**), congestion management programs (**Impact Trans-2**), design feature hazards or incompatible uses (**Impact Trans-3**), emergency access (**Impact Trans-4**), and adopted transportation policies, plans, or programs (**Impact Trans-5**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to transportation and traffic:

- Recreation Areas
- Sites Pumping/Generating Plant

- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to transportation and traffic as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to transportation and traffic as described for Alternative B.

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

However, these differences in the size of the facility footprint, alignment, or construction disturbance area (between Alternative C and Alternatives A and B) would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on congestion management programs (**Impact Trans-2**), design feature hazards or incompatible uses (**Impact Trans-3**), emergency access (**Impact Trans-4**), and adopted transportation policies, plans, or programs (**Impact Trans-5**) as described for Alternative A.

The changes to facility footprints and construction disturbance areas would, however, result in a different number of ADT with peak construction trips, with an associated change in Level of Service. The changes associated with implementation of Alternative C, as related to **Impact Trans-1**, are described below.

All Primary Study Area Project Facilities

Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation

When compared to Alternative A there would be an increase in construction trips along I-5, County Road 68, County Road D, County Road 69, Maxwell Sites Road, and Sites Lodoga Road due to a larger Sites Reservoir with Alternative C than with Alternative A. When compared to Alternative B, there would be an increase in construction trips related to the larger Delevan Pipeline Intake Facilities (which are not included in Alternative B) and the Delevan Transmission Line (which is a shorter transmission line in Alternative B). The roadway Level of Service for each facility prior to and during construction is presented in Table 26-19.

All roadways would continue to operate at an acceptable Level of Service. Traffic levels on roadways would increase during Project construction, particularly before construction activities start and after they end each day, and would result in an increase in traffic congestion. The Level of Service on County Road 68 between County Road F and I-5, County Road 69 between I-5 and County Road F, County Road D between the Glenn/Colusa County Line and County Road 57, Maxwell Sites Road between I-5 and Sutton Road and between the GCID Canal and Sites Lodoga Road, Sites Lodoga Road between Maxwell Sites Road and Leesville Lodoga Road, and Delevan Road between Four Mile Road and the GCID Canal would change Level of Service, but would still meet the County roadway criteria of Level of Service C or better. This increase in vehicle traffic and congestion would result in a **less-than-significant impact** because Level of Service criteria would not be exceeded, when compared to Existing Conditions and the No Project/No Action Alternative.

Traffic levels associated with Project operations and maintenance would increase, when compared to Existing Conditions and the No Project/No Action Alternative. Project operation- and maintenance-related traffic would use the same roads that were used for Project construction but would require 60 total vehicles trips per day throughout the Primary Study Area, which would not impact the roadway Level of Service. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, due to the low number of vehicle trips associated with Project operations and maintenance.

RVDs have been estimated by Project Economists for Alternative C at 373,659 per year (Pavich, 2012). Maxwell Sites Road is expected to have traffic levels that would result in Level of Service D during the Friday through Sunday period during the recreation season (either the March to November or May to September recreation season). I-5 would have Level of Service A or B. County Roads 68, 69, and D are expected to have traffic levels that would result in Level of Service E during the Friday through Sunday period of a March to November recreation season, or a Level of Service that is worse than F during the Friday through Sunday period of a May to September recreation season. This increase would result in a **significant impact** on the Level of Service of County roads listed above, and a **less-than-significant impact** on I-5's Level of Service, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 26-19
2010 and Alternative C Construction Level Of Service

Roadway	Segment	Calculated 2010 ADT	2010 Level of Service*	ADT with Peak Construction Trips	Peak Construction Level of Service
Glenn County Roadways					
I-5	Glenn/Colusa County Line to County Road 68	26,523	C	28,149	C
I-5	County Road 16 to SR 32 E	26,523	C	27,537	C
SR 32	I-5 to SR 45	10,800	D	10,868	D
County Road 68	County Road F to I-5	192	A	1,620	B
County Road 68	I-5 to County Line/Norman Road	232	A	300	A
County Road 69	I-5 to County Road F	20	A	1,448	B
County Road D	Glenn/Colusa County Line to County Road 57	402	A	1,810	B
Canal Road	SR 32 to end of road	1,740	B	2,094	B
Colusa County Roadways					
I-5	SR 20 to Maxwell Colusa Road	25,698	C	26,712	C
I-5	Delevan Road to Glenn/Colusa County Line	26,010	C	27,620	C
SR 45	Maxwell Colusa Road to County Road P29	2,185	B	2,471	B
SR 45	County Road P29 to Glenn/Colusa County Line	2,393	B	2,679	B
SR 162	County Road D to SR 45	8,800	D	9,086	D
Maxwell Sites Road	I-5 to Sutton Road	1,812	B	3,172	C
Maxwell Sites Road	GCID Canal to Sites Lodoga Road	754	A	2,114	B
Huffmaster Road	Beginning of road to end of road	N/A	N/A	730	A
Sites Lodoga Road	Maxwell Sites Road to Leesville Lodoga Road	439	A	1,079	B
Delevan Road	Four Mile Road to GCID Canal	500	A	1,016	B
Sutton Road	Maxwell Sites Road to Delevan Road	234	A	414	A
Excelsior Road/Four Mile Road	Maxwell Road to Delevan Road	51	A	231	A
Pole Line Road/Two Mile Road	Delevan Road to Maxwell Colusa Road	88	A	268	A
Maxwell Road	I-5 to SR 45	2,535	B	2,821	B
McDermott Road	Maxwell Sites Road to Lenahan Road	364	A	880	A

*Refer to Tables 26-4 and 26-5 for the Level of Service criteria.

Note:

ADT = Average Daily Traffic
I = Interstate Freeway
SR = State Route

Source: Colusa County, 2011; Caltrans, 2009 and 2010.

26.4 Mitigation Measures

26.4.1 Navigation

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

26.4.2 Transportation and Traffic

Mitigation measures are provided below and summarized in Table 26-20 for the impacts that have been identified as significant or potentially significant.

Table 26-20
Summary of Mitigation Measures for
NODOS Project Impacts to Traffic

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Trans-1: Conflict with an Applicable Plan, Ordinance, or Policy Establishing Measures of Effectiveness for the Performance of the Circulation System, Considering all Modes of Transportation	Sites Reservoir Inundation Area and Recreation Areas (operation – recreation traffic)	Significant	Mitigation Measure Trans-1: Prepare and Implement a Project Operation Traffic Control Plan	Less than Significant
Impact Trans-3: Substantially Increase Hazards Due to Design Feature or Incompatible Uses	All Project facilities (construction)	Potentially Significant	Mitigation Measure Trans-3: Prepare and Implement a Project Construction Traffic Control Plan	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Trans-1: Prepare and Implement a Project Operation Traffic Control Plan

DWR and Reclamation shall prepare and implement an Operation Traffic Control Plan for the Project. Consultation with Glenn and Colusa counties shall occur to determine what those agencies would require to manage the traffic congestion that is expected to occur as a result of recreationists traveling to Sites Reservoir and its Recreation Areas. It is possible that the Counties may want to wait to do any road improvements until a recreation season (or more) has passed, so that actual recreation visitation and associated traffic congestion on local roadways could be monitored.

Consultation and coordination with Caltrans shall also occur to manage traffic at onramps and offramps from I-5 that would connect to the County roads leading to Sites Reservoir and its Recreation Areas.

Consultation with local fire and sheriff departments shall occur to obtain input regarding maintaining adequate emergency response times and access to properties along the roads that comprise the routes to Sites Reservoir and its Recreation Areas.

The Operation Traffic Control Plan may include, but not be limited to, ideas such as:

- Widening the existing County roads that comprise the primary route to Sites Reservoir and its Recreation Areas, and maintaining such roads
- Signalizing or signage at intersections along the primary route to Sites Reservoir and its Recreation Areas
- Developing alternate routes to Sites Reservoir that would intersect at Maxwell Sites Road and signalizing that intersection
- Providing bus service to Sites Reservoir and its Recreation Areas and providing a Park and Ride Lot at the bus pickup location
- Provisions for maintaining emergency vehicle access (detailed measures to be developed in coordination with the local sheriff and fire departments)
- Provisions to reduce potential school bus delays that may occur as a result of Project recreation visitation traffic (detailed measures to be developed in coordination with the local school district and sheriff departments)
- Directional roadway signage to Sites Reservoir and its Recreation Areas

The Operation Traffic Control Plan shall be prepared in coordination with, and approved by, affected agencies, such as Caltrans, Glenn County, Colusa County, and Maxwell Unified School District.

Mitigation Measure Trans-3: Prepare and Implement a Project Construction Traffic Control Plan

DWR and Reclamation shall prepare and implement a Construction Traffic Control Plan for the Project. The Construction Traffic Control Plan shall include, but would not be limited to, the following measures that are intended to manage:

- Construction-related traffic
- Temporary and/or permanent bus reroutes
- Pavement repairs before and after construction
- Measures to reduce emergency vehicle delay and maintain emergency vehicle access (detailed measures to be developed in coordination with the local sheriff and fire departments)
- Measures to accommodate potential school bus reroutes and reduce potential school bus delays (detailed measures to be developed in coordination with the school district and sheriff departments)
- Construction site parking
- Construction signage

The Construction Traffic Control Plan shall be prepared in coordination with, and approved by, affected agencies, such as Caltrans, Glenn County, Colusa County, and Maxwell Unified School District.

Implementation of **Mitigation Measures Trans-1** and **Trans-3** would reduce the level of significance of Project impacts to transportation and traffic to **less than significant**.

26.5 References

26.5.1 Navigation

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26.5.2 Transportation and Traffic

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27. Noise

27.1 Introduction

This chapter describes the noise setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for noise is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Effects of Project noise on wildlife are discussed in Chapter 14 Terrestrial Biological Resources, and the effects of groundborne vibration on fish are discussed in Chapter 12 Aquatic Biological Resources. Mitigation measures are provided for identified significant impacts, where appropriate.

27.2 Affected Environment

27.2.1 Introduction

Noise is defined as unwanted sound. Levels of sound are measured and expressed in decibels (dB). Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Methods used to measure or quantify sound levels depend on the source, the receiver, and the reason for measurement.

The most common metric is the overall A-weighted sound level measurement, which measures sound in a manner similar to the way a person perceives or hears sound, thus achieving a strong correlation for evaluating acceptable and unacceptable sound levels. A-weighted measurement has been adopted by regulatory agencies worldwide. These sound levels are expressed as dBA.

A-weighted sound levels are typically measured or presented as L_{eq}, which is defined as the average sound level on an equal energy basis for a stated period of time. The L_{eq} is commonly used to measure steady state sound or noise that is usually dominant. The relative A-weighted noise levels of common sounds measured in the environment and industry for various qualitative sound levels are provided in Table 27-1.

Table 27-1
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Qualitative Description
Carrier Deck Jet Operation	140	
	130	Pain threshold
Jet Takeoff (200 feet)	120	
Auto Horn (3 feet)	110	Maximum vocal effort
Jet Takeoff (1,000 feet) Shout (0.5 feet)	100	

Table 27-1
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Qualitative Description
New York Subway Station Heavy Truck (50 feet)	90	Very annoying Hearing damage (8-hour, continuous exposure)
Pneumatic Drill (50 feet)	80	Annoying
Freight Train (50 feet) Freeway Traffic (50 feet)	70 to 80	
	70	Intrusive (Telephone use difficult)
Air Conditioning Unit (20 feet)	60	
Light Auto Traffic (50 feet)	50	Quiet
Living Room, Bedroom	40	
Library, Soft Whisper (5 feet)	30	Very quiet
Broadcasting/Recording Studio	20	
	10	Just audible

Source: New York Department of Environmental Conservation. 2001.

Statistical methods are used to capture the dynamics of a changing acoustical environment. These measurements are typically denoted by L_{xx}, where $_{xx}$ represents the percent of time a sound level is exceeded. The L_{90} represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period. Another sound level expression is L_{max}, which is the maximum sound pressure level over a defined period.

Another metric used in determining the effect of environmental noise is the difference in response that people have to daytime and nighttime noise levels. During the evening and at night, exterior background noises are generally lower than daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are more sensitive to intrusive noises at that time. To account for human sensitivity to evening and nighttime noise levels, the Daytime-Nighttime Noise Level (DNL) (also abbreviated as L_{dn}) and the Community Noise Equivalent Level (CNEL) for California were developed. The DNL is a noise metric that accounts for the greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.). The CNEL is a noise index that accounts for the greater annoyance of noise during the evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours.

DNL values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period and applying a weighting factor to the nighttime L_{eq} values. CNEL values are calculated similarly, except that a weighting factor is also added to evening L_{eq} values. The weighting factors, which reflect the increased sensitivity to noise during evening and nighttime hours, are added to each hourly L_{eq} sound level before the 24-hour DNL or CNEL is calculated. For the purposes of assessing noise, the 24-hour day is divided into three time periods, with the following weightings:

- Daytime hours: 7:00 a.m. to 7:00 p.m. (12 hours) – Weighting factor of 0 dBA
- Evening hours (for CNEL only) 7:00 p.m. to 10:00 p.m. (3 hours) – Weighting factor of 5 dBA
- Nighttime hours (for both CNEL and DNL) 10:00 p.m. to 7:00 a.m. (9 hours) – Weighting factor of 10 dBA

The adjusted time period noise levels are then averaged (on an energy basis) to compute the overall DNL or CNEL value. For a continuous noise source, the DNL value is easily computed by adding 6.4 dBA to the overall 24-hour noise level (L_{eq}). For example, if the expected continuous noise level from a noise source is 60.0 dBA, the resulting DNL from the source would be 66.4 dBA. Similarly, the CNEL for a continuous noise source is computed by adding 6.7 dBA to the overall 24-hour L_{eq}. Given the small differences, the two are often used interchangeably.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities, such as speech, sleep, learning
- Physiological effects, such as startling and hearing loss

In most cases, environmental noise effects are limited to the first two categories - creating an annoyance or interference with activities. No completely satisfactory way exists to measure the subjective effects of noise or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Therefore, an important way of determining a person's subjective reaction to a new noise is to compare it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise is, as perceived by the exposed individual.

The general human response to changes in noise levels that are similar in frequency content (for example, comparing increases in continuous [L_{eq}] traffic noise levels) are summarized as follows:

- A 3 dB change in sound level is considered a barely noticeable difference
- A 5 dB change in sound level is typically noticeable
- A 10 dB change is considered to be a doubling in loudness

27.2.2 Extended Study Area

The Extended Study Area consists of the Central Valley Project and the State Water Project service areas located in northern and southern California. Noise levels in these areas can vary considerably, depending on the location, season, and time of day. Noise levels in noisy urban settings can be as high as 75 dBA during the day. In extremely isolated outdoor locations with no wind, wildlife, or running water, noise levels may be less than 20 dBA. Typical noise levels in rural settings are approximately 40 dBA during the day and 30 dBA during the night. In wilderness areas, ambient noise levels are on the order of 20 dBA (USEPA, 1971). In rural areas with low population density, the LD_n likely varies between 35 to 40 dBA (Miller, 2002). Noise levels in recreational settings, such as San Luis Reservoir, can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

Noise-sensitive land uses generally are defined as locations where people reside or where the presence of unwanted sound could adversely affect the designated use of the land. Noise-sensitive land uses located in the Extended Study Area include residences, hospitals, places of worship, libraries, and schools, as well as nature and wildlife preserves and parks.

27.2.3 Secondary Study Area

The Secondary Study Area consists of existing facilities in 22 counties in northern California that may be affected by Project operation. Descriptions of the ambient noise levels in these counties are provided below; however, because noise is a local phenomenon that is influenced by discrete activities, noise levels at the existing facilities not proposed for modification are not discussed in this section. Similar to the Extended Study Area, noise-sensitive land uses located in the Secondary Study Area include residences, hospitals, places of worship, libraries, and schools, as well as nature and wildlife preserves and parks.

27.2.3.1 Alameda

Transportation noise in Alameda County includes vehicle, aircraft, and train traffic. Major roadways in the County include Interstates 80, 580, 680, 880, and 980, and numerous State Routes. Railroad activity occurs along two railroad lines of the Union Pacific Railroad and also along the Bay Area Rapid Transit (BART) system. There are three public airports within Alameda County: Oakland International Airport, Hayward Executive Airport, and Livermore Municipal Airport. Other sources of noise in the county include stationary noise sources associated with industrial and commercial uses (Alameda County, 1985; Alameda County, 2000; Alameda County, 2009).

27.2.3.2 Butte

Transportation noise in Butte County includes vehicle, aircraft, and train traffic. Major roadways in the county include State Routes 32, 70, 99, 149, 162, and 191. Railroad activity occurs along two railroad lines of the Union Pacific Railroad. One line is aligned parallel to the west side of State Route 99. The other line is generally parallel to the east and west sides of the Feather River. There are four public airports within Butte County: Chico Municipal, Oroville Municipal, Paradise Skypark, and Ranchero.

Non-transportation noise sources in the county include noise from commercial, industrial, and public facilities. Significant stationary noise sources in unincorporated Butte County are the Neal Road Recycling and Waste Facility, solid waste transfer stations, aggregate mining operations, general service commercial and light industrial uses, recreational uses, and parks and school playing fields (Butte County, 2009). Noise levels in recreational settings, such as Lake Oroville and the Thermalito Complex, can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

27.2.3.3 Colusa

Ambient noise levels in portions of Colusa County are defined primarily by traffic on major roadways, including, but not limited to, Interstate 5 and State Routes 16 and 20. Agricultural activities, as well as aircraft from the Colusa County Airport, also contribute to the noise environment. In addition, there are numerous stationary noise sources (e.g., quarry operations, lumber mills, industrial facilities) dispersed throughout the county (Colusa County, 2012).

27.2.3.4 Contra Costa

The primary source of noise in Contra Costa County is from transportation, which includes vehicle, aircraft and train traffic. Vehicular traffic along freeways (e.g., Interstates 80 and 680 and State Routes 24 and 4), and major arterials (e.g., Willow Pass Road and Ygnacio Valley Road) are the primary sources of vehicular traffic noise. Rail operations produce noise along the Atchison Topeka and Santa Fe and Southern Pacific railroad corridors. Passbys from the Bay Area Rapid Transit system also contribute to noise from train traffic. Aircraft from Buchanan Field, near Concord, is the primary source of aircraft noise. Other sources of aircraft noise are local airports and military helicopter activity. Motorized boats along the San Joaquin River also contribute noise.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, and heavy equipment use. Industrial plants, such as oil refineries and materials processing plants, contribute noise as do operations at the Camp Parks Reserve Forces Training Area (Contra Costa County, 2005).

27.2.3.5 Del Norte

Ambient noise levels in portions of Del Norte County are defined primarily by traffic on major roadways, including, but not limited to, Interstates 101 and 199. Aircraft from the Jack McNamara Field contribute to the noise environment. There are also numerous stationary noise sources dispersed throughout the county (Del Norte County, 2003).

27.2.3.6 El Dorado

Ambient noise levels in portions of El Dorado County are defined primarily by traffic on major roadways, including, but not limited, to U.S. 50 and State Routes 49, 193, and 89. Aircraft from the Cameron Airpark Airport, Placerville Airport, Georgetown Airport, Lake Tahoe Airport, and Sacramento Mather Airport contribute to the noise environment. There are also numerous stationary noise sources (e.g., quarry operations, lumber mills, industrial facilities) dispersed throughout the county (El Dorado County, 2003). Noise levels in recreational settings, such as Folsom Lake, can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

27.2.3.7 Glenn

Ambient noise levels in portions of Glenn County are defined primarily by traffic on major roadways, including, but not limited to, Interstate 5 and State Route 162. Aircraft from the Willow-Glenn County Airport also contribute to the noise environment. In addition, there are numerous stationary noise sources throughout the county (Glenn County, 1993).

27.2.3.8 Humboldt

Ambient noise levels in portions of Humboldt County are defined primarily by traffic on major roadways, including, but not limited to, U.S. 101, and State Routes 36, 255, and 299. Train traffic from the Northwestern Pacific Railroad and aircraft from the Rohnerville, Dinsmore, Murray Field, and City of Eureka airports also contribute to the noise environment. In addition, there are numerous stationary noise sources throughout the county (Humboldt County, 2008).

27.2.3.9 Marin

Vehicle traffic is the primary source of noise in Marin County, with the highest noise levels occurring along major highways (U.S. 101 and State Routes 1 and 37) and major county roads (including Sir Francis Drake Boulevard, Petaluma Point Reyes Road, Lucas Valley Road, and Novato Boulevard). Other significant local noise sources include aircraft from Rafael Airport, Gnoss Field, and the Richardson Bay Helipad, trains, mining activity, and construction (Marin County, 2007).

27.2.3.10 Placer

Ambient noise levels in portions of Placer County are defined primarily by traffic on major roadways, including, but not limited to, Interstate 80 and State Routes 20, 28, 49, 65, 89, and 193. Aircraft from the Lincoln Regional Airport, Auburn Airport, and Truckee-Tahoe Airport also contribute to the noise environment. In addition, there are numerous stationary noise sources throughout the county. Noise levels in recreational settings such as Folsom Lake can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

27.2.3.11 Sacramento

The primary source of noise in Sacramento County is from transportation, which includes vehicle, aircraft, and train traffic. There are five freeways in the county (Interstates 5 and 80, State Routes 99 and 160, and U.S. 50) that all converge near downtown Sacramento, seven public airports, and multiple heavy and light rail lines. There are also numerous arterial roadways and highways that have two to eight lanes that generate noise. Motorized boats along the Sacramento River also contribute noise.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities (Sacramento County, 2010). Noise levels in recreational settings such as Folsom Lake can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

27.2.3.12 San Francisco

Noise sources in San Francisco County include personal and public transportation vehicles (including rail, bus, and cable car), aircraft from the San Francisco International Airport, commercial and industrial activities, construction, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor events (City and County of San Francisco, 1996).

27.2.3.13 San Mateo

Transportation noise in San Mateo includes vehicle and aircraft traffic. Major roadways in the county include U.S. 101, Interstates 280 and 380, and State Routes 1, 82, 84 and 92. Aircraft from the San Francisco International Airport and two general aviation airports (Half Moon Bay and San Carlos) contribute to the noise environment.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities (San Mateo County, 1986).

27.2.3.14 Santa Clara

Transportation noise in Santa Clara County includes vehicle and aircraft traffic. Major roadways in the county include U.S. 101, Interstate 880, and several State Routes. Aircraft from the San Jose International Airport, Moffett Field, and three general aviation airports also contribute to the noise environment.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities (Santa Clara County, 1994).

27.2.3.15 Shasta

Transportation noise in Shasta County includes vehicle, aircraft, and train traffic. Major roadways in the county include State Routes 44, 89, 273 and 299, and Interstate 5. The principal railroad activity in the county occurs along the Union Pacific Railroad main line track that is aligned north/south. In addition to vehicle and train traffic, aircraft from the Redding Municipal Airport, Shingletown Airport, and Fall River Mills Airport contribute to the noise environment.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities (Shasta County, 2004). Noise levels in recreational settings, such as Shasta and Whiskeytown lakes, can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).

27.2.3.1 Solano

Bisecting the county from north to south, Interstate 80 is the dominant noise source in Solano County, with State Routes 12 and 113 also contributing transportation noise. In addition to freeway noise, the county's ambient noise levels include local traffic on city streets, commercial and industrial uses, active recreation areas of parks and outdoor play areas, railroad operations, and aircraft overflights. Motorized boats along the Sacramento River also contribute noise (Solano County, 2008).

27.2.3.2 Sonoma

Transportation noise in Sonoma County includes vehicle, aircraft, and train traffic. Major roadways in the county include State Routes 1, 12, 116, 121, and 128, U.S. 101, and county roads. The principal railroad activity occurs along the Northwest Pacific Railroad. It parallels U.S. 101 the entire length of the county. In addition to vehicle and train traffic, aircraft from the Charles M. Schulz Airport contribute to the noise environment.

Non-transportation noise sources in the county include agriculture (primarily wineries and cattle ranching), industrial and heavy commercial activities, the Infineon International Raceway, geothermal power plants at the Geysers, solid waste landfills and transfer stations, concerts, and other outdoor events (Sonoma County, 2008).

27.2.3.3 Sutter

The dominant sources of noise in Sutter County are related to transportation and include automobile and truck traffic, aircraft, and trains. State Routes 20, 70, 99 and 113 are major sources of traffic noise. Sutter County Airport is the only publicly owned and operated airport in the county. Noise from aircraft traffic at Sacramento International Airport, located approximately one mile south of the southern Sutter County's border, also influences Sutter County's noise environment. In addition, two rail lines are active in the county: the Southern Pacific Transportation Company and Union Pacific Railroad.

Stationary sources of noise in the county include natural gas extraction facilities, construction sites, mining activities, agricultural activities, and commercial and industrial facilities (Sutter County, 1996).

27.2.3.4 Tehama

The major noise sources in Tehama County consist of highway and local traffic on county roads, as well as commercial and industrial uses, airports, and railroad operations. Major roadways in the county include Interstate 5 and State Routes 32, 36, 89, and 99. The only active railroad operation within Tehama County is the Union Pacific Railroad. There are two public airports within Tehama County: Corning Municipal Airport and Red Bluff Municipal Airport (Tehama County, 2009). Existing sources of noise at/near the location of the existing Red Bluff Pumping Plant include roadway traffic and stationary noise sources, such as mechanical equipment at the Red Bluff Pumping Plant, the existing Red Bluff Diversion Dam, and the T-C Canal Intake, as well as noise from activities on the Sacramento River.

27.2.3.5 Trinity

Transportation noise in Trinity County includes vehicle, aircraft, and train traffic. Major roadways in the county include State Routes 3, 36, and 299, and county roads. The principal railroad activity in the county occurs along the Northwest Pacific Railroad. It parallels Highway 101 the entire length of the county. Aircraft from the Weaverville, Ruth, Hyampom, Hayfork and Trinity Center airports contribute to the noise environment.

Noise levels in recreational settings, such as Trinity and Lewiston lakes, can range from 55 to 65 dBA during the day, dropping to 50 to 60 dBA at night (Miller, 2002).Non-transportation noise sources in the county include stationary sources, such as the Weaverville landfill/transfer station, the Trinity River lumber mill, concrete/aggregate plants, and other industrial facilities (Trinity County, 2003).

27.2.3.6 Yolo

Noise sources in eastern Yolo County and West Sacramento include transportation and non-transportation activities. Traffic noise occurs along the corridors of Interstates 5 and 80, and State Route 84. Rail operations from freight and passenger traffic, and aircraft from the Sacramento International Airport and Bourges-Clarksburg Airport, contribute to the noise environment. Motorized boats along the Sacramento River also contribute noise. Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, and heavy equipment use (Yolo County, 2009).

27.2.3.7 Yuba

The dominant sources of noise in Yuba County are from transportation, which includes vehicle, train, and aircraft traffic. Major roadways in the county include State Routes 20, 65 and 70. Two major railroad lines, Southern Pacific and Union Pacific, contribute rail traffic noise. Aircraft from the Yuba County Airport and Beale Air Force Base contribute to the noise environment.

Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, natural gas compression stations, and heavy equipment use (Yuba County, 1996).

27.2.4 Primary Study Area

Existing noise levels are described at each of the proposed Project facility locations. Ambient noise levels are estimated based on existing land uses. Noise-sensitive land uses are described by Project feature. Noise-sensitive land uses include residences, hospitals, places of worship, libraries, and schools, as well as nature and wildlife preserves and parks.

27.2.4.1 Sites Reservoir Inundation Area and Sites Reservoir Dams, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Recreation Areas, and Road Relocations and South Bridge

The majority of the footprint of the proposed Sites Reservoir, its proposed dams, pumping/generating plant, tunnel to the inlet/outlet structure, the inlet/outlet structure, electrical switchyard, field office maintenance yard, recreation areas, bridge, and roads would be located within Colusa County in what is currently a rural and sparsely populated area. Within the vicinity of these Project features, there are several residences and one paved road (Maxwell Sites Road, which, as it continues west, becomes Sites Lodoga Road). Ambient noise levels in this area are expected to be low due to the few roads and the sparse population. The primary noise source is traffic noise and noise associated with ranching operations.

The northernmost portion of the proposed Sites Reservoir would be located within Glenn County. No developed road access exists in this area. Road 69 dead-ends three miles west of the existing T-C Canal, which is located to the east of the proposed reservoir site. Noise sources along/near Road 69 include a few rural residences and agricultural operations. Ambient noise levels in this area are expected to be low due to the general lack of roads and residences in the area, and the limited accessibility of the area.

27.2.4.2 Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The existing Funks Reservoir is located within Colusa County. There is no public access to the reservoir; the T-C Canal levee road that provides access to the reservoir has locked gates to provide access to only authorized personnel. Similar to Sites Reservoir, Funks Reservoir is located in an area that is expected to have low ambient noise levels. No noise-sensitive receptors are located within a one-mile buffer around the proposed Funks Reservoir Dredging area. Primary noise sources at the reservoir include wildlife that visit the site, as well as human and vehicle noise when the reservoir is visited by authorized personnel.

The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard are proposed to be located adjacent to and on the east side of the existing Funks Reservoir. The area is currently undeveloped open space that is not accessible to the public. This area is expected to have low ambient noise levels. No noise-sensitive receptors are located within a one-mile buffer around the Hothouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard. Primary noise sources in this area include wildlife that visit the site, agricultural operations, and human and vehicle noise from authorized personnel using the portion of the T-C Canal levee road that is nearby.

27.2.4.3 Terminal Regulating Reservoir (includes the Terminal Regulating Reservoir to Funks Creek Pipeline and Outlet), Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Terminal Regulating Reservoir Pipeline, and Terminal Regulating Reservoir Pipeline Road

The proposed TRR, its connection to the GCID Canal, the pumping plant and electrical switchyard, two pipelines, and maintenance road would be located within Colusa County. Similar to Sites Reservoir, the TRR and associated facilities would be located in an area that is expected to have low ambient noise levels. There are a few residences within a 0.5-mile radius of the proposed TRR location. The nearest residences are located northeast of and adjacent to the TRR. This area is agricultural, so the primary noise source is agricultural equipment that currently operates at the TRR site and in all directions around the site. Due to the proposed TRR's location near existing local roads (Delevan, Mc Dermott, and Lenahan roads), traffic noise also contributes to the ambient noise setting.

27.2.4.4 Glenn-Colusa Irrigation District Canal Facilities Modifications

The GCID Canal Facilities Modifications would be located in Glenn County. The proposed headgate and canal lining sites would be located approximately five miles northwest of Hamilton City within the existing GCID Canal. Existing land uses in the area, in all directions surrounding the GCID Canal facilities, include agriculture (row crops and orchards), a few rural residences, and undeveloped open space. This area is expected to have low ambient noise levels; noise sources include vehicle traffic and equipment associated with farming operations. The nearest residence is located approximately 680 feet west of the proposed headgate structure.

The site of the proposed railroad siphon replacement is at the GCID Canal at the southeast edge of the City of Willows. Existing land uses in the area include residential to the south and west, commercial to the west, light industrial and undeveloped open space to the north, and agricultural to the east. This area is expected to have low ambient noise levels; noise sources include vehicle traffic and equipment associated with farming operations. The nearest residence is located approximately 100 feet southwest of the proposed railroad siphon replacement location.

27.2.4.5 Delevan Pipeline, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line

The proposed Delevan Pipeline, Delevan Pipeline Electrical Switchyard, and Delevan Transmission Line would be located within agricultural fields and orchards in Colusa County. Similar to Sites Reservoir, the Delevan Pipeline, Electrical Switchyard, and Transmission line would be located in an area that is expected to have low ambient noise levels. However, intermittent noise sources include crop dusters and/or helicopters, the use of propane cannons to reduce bird depredation, and gun shots during hunting season. There are various residences adjacent to and within a 0.5-mile radius of the proposed Delevan Pipeline and Delevan Transmission Line locations. The nearest residence to the proposed Delevan Pipeline Electrical Switchyard location is approximately 1.7 miles to the east.

27.2.4.6 Delevan Pipeline Intake/Discharge Facilities

The proposed Delevan Pipeline Intake/Discharge Facilities would be located at the eastern terminus of the proposed Delevan Pipeline at the Sacramento River. The footprint of the intake/discharge facilities proposed for Alternatives A and C is larger than the discharge-only facilities proposed for Alternative B; however, their location is the same. The existing noise sources in this area include agricultural operations associated with the orchards that are located at the site, vehicle traffic noise from SR 45, noise from boat traffic and humans on the Sacramento River, and the noise that is generated from the existing Maxwell Irrigation District pumps that are located adjacent to and north of the proposed intake/discharge facilities location. There are two residences within a one-mile buffer of the proposed Delevan Pipeline Intake/Discharge Facilities.

27.2.4.7 Project Buffer

The Project Buffer would surround all of the Primary Study Area Project facilities, except for the Delevan Pipeline and Transmission Line, TRR Pipeline and Road, Delevan Pipeline Electrical Switchyard, TRR to Funks Creek Pipeline, and portions of the roads. The existing noise sources and proximity of noise-sensitive receptors within a given area of the Project Buffer would, therefore, be the same as those described for the Project facilities that the Project Buffer surrounds.

27.3 Environmental Impact/Environmental Consequences

27.3.1 Regulatory Setting

Noise associated with projects are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These policies are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

27.3.1.1 Federal Plans, Policies, and Regulations

- Federal guidance for environmental noise and regulations for specific sources (for example, aircraft or federally funded highways) by the Federal Energy Regulatory Commission, Federal Transit Administration (FTA), Federal Railroad Administration, Federal Highway Administration (FHWA), Federal Aviation Administration, U.S. Environmental Protection Agency, and the U.S. Department of Housing and Urban Development

A summary of various federal noise guidelines is presented in Table 27-2. As an example, the Federal Railroad Administration (FRA) and Federal Transit Administration (FTA) guidelines are presented on a sliding scale. Therefore, if the existing noise exposure at a sensitive receptor is 50 dBA, an effect would occur if an increase of 5 dBA is predicted.

Table 27-2
Summary of Federal Guidelines/Regulations for Residential Exterior Noise

Agency	L_{eq}[e] (dBA)	DNL[f] (dBA)
Federal Energy Regulatory Commission	**49**	55
Federal Highway Administration	67	67
Federal Aviation Administration	**59**	65
Federal Railroad Administration and Federal Transportation Administration[a,b]	Sliding scale	Sliding scale
U.S. Environmental Protection Agency[c]	**49**	55
U.S. Department of Housing and Urban Development[d]	**59**	65

[a]FRA 1998.
[b]FTA 2006.
[c]EPA 1974.
[d]24 CFR Part 51B.
[e]The average sound level on an equal energy basis for a stated period of time. The L_{eq} is commonly used to measure steady state sound or noise that is usually dominant.
[f]The Daytime/Nighttime Noise Level (DNL) was developed to account for human sensitivity to evening and nighttime noise levels. The DNL is a noise metric that accounts for greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.).

Notes:
Bold numbers indicate calculated equivalent standard. Because the Federal Highway Administration regulates peak hour noise level, the DNL is assumed equivalent to the peak noise hour.
dBA = decibel A-weighted sound level; the sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network.

27.3.1.2 State Plans, Policies, and Regulations

- California Noise Control Act of 1973 (California Health and Safety Code Sections 46000-46080)
- DWR Specification 05-16 (Section 01570 Environmental Protection)[1]

[1] DWR Specification 05-16, Section 01570 Environmental Protection describes the requirements for conservation and protection of environmental resources at construction work sites, Part 1.07(B)(3) addresses the threshold for establishing noise impacts to wildlife and the recommended mitigation for such potential impacts.

- California Administrative Code Title 4
- California Government Code §65302(f)

27.3.1.3 Regional and Local Plans, Policies, and Regulations

- Tehama County General Plan
- Glenn County General Plan
- Colusa County General Plan

27.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for noise:

Would the Project:

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies?
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?
- Result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?
- Result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?
- Expose people residing or working in the Project area to excessive noise levels (for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport).?
- Expose people residing or working in the Project area to excessive noise levels (for a project within the vicinity of a private airstrip)?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Expose persons to or generation of noise levels in excess of standards established in the local General Plans, or applicable standards of other agencies.
- Expose persons to or generation of excessive groundborne vibration or groundborne noise levels.
- Result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project.

- Expose people residing or working in the Project area to excessive noise levels (for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport).
- Expose people residing or working in the Project area to excessive noise levels (for a project within the vicinity of a private airstrip).

27.3.3 Impact Assessment Assumptions and Methodology

27.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to noise levels:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.
- All residences located outside of proposed Project facility footprints, but within the Project Buffer, would be acquired, vacated, and demolished, as necessary, prior to the start of Project construction.
- Project construction activities and the transportation/delivery of construction vehicles, equipment, and materials are anticipated to occur between the hours of 6:00 a.m. and 7:00 p.m. on Mondays through Fridays. Nighttime and weekend construction and transportation/delivery of construction vehicles, equipment, and materials are not planned, but may occur on an as-needed basis. Nighttime construction would not be conducted within 1,000 feet of occupied residences between 10:00 p.m. and 7:00 a.m. Project construction haul times in residential communities would be limited to 7:00 a.m. to 10:00 p.m., and air brake restrictions would be applied in residential communities.

- Construction of Project facilities would require a substantial number of workers traveling to construction sites during the construction period (refer to Chapter 26 Navigation, Transportation, and Traffic). Truck traffic associated with the transport of construction materials, borrow and spoil materials, and concrete would also increase the number of heavy vehicles on roadways in the vicinity of the work sites during construction. Construction would increase the number of construction vehicles on the roadways adjacent to the construction activities. Passenger vehicles transporting workers would add to existing volumes and associated noise levels along the major transportation roadways in the vicinity of Project facilities. Truck traffic would be distributed throughout the day. Construction would also require other noise- and vibration-generating activities such as clearing and grubbing, demolition of existing structures, excavation, drilling, and blasting.
- Project implementation would involve the long-term operation of noise-generating stationary equipment, including pumping plants, mechanical cleaning mechanisms on fish screens, and emergency generators.

27.3.3.2 Methodology

<u>Construction</u>

The area of influence for the evaluation of the impact of Project construction activities on ambient noise levels is defined as a 0.5-mile radius around the noise source. At a 0.5-mile radius around the noise source, there would be a 34-dBA noise reduction compared to a reference distance of 50 feet. It is important to note that other attenuating mechanisms, such as atmospheric or ground effects, may increase the amount of attenuation further, resulting in even lower noise levels. For construction equipment with typical reference noise levels of 80 and 90 dBA at 50 feet, this attenuation would result in noise levels from the equipment being reduced to 46 to 56 dBA at the 0.5-mile distance, respectively. Although these noise levels may still be noticeable at this distance, they would typically fall within the range of the Tehama, Colusa, and Glenn County General Plan requirements for steady operations.

Construction noise impacts were evaluated by estimating noise levels from various construction activities. Table 27-3 lists equipment noise levels from Table 1 of the FHWA Roadway Construction Noise Model User's Guide (FHWA, 2006). All listed noise levels are maximum A-weighted sound pressure levels (L_{max}) at a reference distance of 50 feet. The acoustical usage factor is the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. The model calculates the total noise level at the receptor by logarithmically summing noise levels from each piece of equipment in use and accounting for the reduction of noise over distance caused by geometric divergence[2]. At farther distances, additional attenuation (e.g., ground effects and atmospheric attenuation) can be substantial, but the model does not account for this additional attenuation. Therefore, the model output should be considered conservatively high.

[2] Geometric divergence is the primary mechanism of noise reduction close to a noise source.

Table 27-3
Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (Percent)	Noise Control Specification Lmax at 50 feet (dBA)	Actual Measured Lmax at 50 feet (dBA)	Actual Data Samples (Count)
All Other Equipment >5 hp	50	85	N/A	0
Auger Drill Rig	20	85	84	36
Backhoe	40	80	78	372
Bar Bender	20	80	N/A	0
Blasting	NA	94	N/A	0
Boring Jack Power Unit	50	80	83	1
Chain Saw	20	85	84	46
Clam Shovel (dropping)	20	93	87	4
Compactor (ground)	20	80	83	57
Compressor (air)	40	80	78	18
Concrete Batch Plant	15	83	N/A	0
Concrete Mixer Truck	40	85	79	40
Concrete Pump Truck	20	82	81	30
Concrete Saw	20	90	90	55
Crane	16	85	81	405
Dozer	40	85	82	55
Drill Rig Truck	20	84	79	22
Drum Mixer	50	80	80	1
Dump Truck	40	84	76	31
Excavator	40	85	81	170
Flat Bed Truck	40	84	74	4
Front End Loader	40	80	79	96
Generator	50	82	81	19
Generator (<25 kVA, variable message signs)	50	70	73	74
Gradall	40	85	83	70
Grader	40	85	N/A	0
Grapple (on backhoe)	40	85	87	1
Horizontal Boring Hydraulic Jack	25	80	82	6
Hydra Break Ram	10	90	N/A	0
Impact Pile Driver	20	95	101	11
Jackhammer	20	85	89	133
Man Lift	20	85	75	23
Mounted Impact Hammer (hoe ram)	20	90	90	212
Pavement Scarafier	20	85	90	2
Paver	50	85	77	9
Pickup Truck	40	55	75	1
Pneumatic Tools	50	85	85	90

Table 27-3
Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (Percent)	Noise Control Specification Lmax at 50 feet (dBA)	Actual Measured Lmax at 50 feet (dBA)	Actual Data Samples (Count)
Pumps	50	77	81	17
Refrigerator Unit	100	82	73	3
Rivet Buster/Chipping Gun	20	85	79	19
Rock Drill	20	85	81	3
Roller	20	85	80	16
Sand Blasting (single nozzle)	20	85	96	9
Scraper	40	85	84	12
Shears (on backhoe)	40	85	96	5
Slurry Plant	100	78	78	1
Slurry Trenching Machine	50	82	80	75
Soil Mix Drill Rig	50	80	N/A	0
Tractor	40	84	N/A	0
Vacuum Excavator (Vac-truck)	40	85	85	149
Vacuum Street Sweeper	10	80	82	19
Ventilation Fan	100	85	79	13
Vibrating Hopper	50	85	87	1
Vibratory Concrete Mixer	20	80	80	1
Vibratory Pile Driver	20	95	101	44
Warning Horn	5	85	83	12
Welder/Torch	40	73	74	5

Notes:
dBA = A-weighted decibel
hp = horsepower
kVA = kilovolt-amperes
L_{max} = maximum sound pressure level
N/A = not available

Source: FHWA, 2006.

Table 27-3 indicates that the loudest equipment generally emits noise in the range of 80 to 90 dBA at 50 feet. Noise at any specific receptor is dominated by the closest and loudest equipment. The types and numbers of construction equipment near any specific receptor location would vary over time. The construction noise estimate was based on assumptions of multiple pieces of loud equipment operating close together near the edge of the construction site. This is believed to be a conservative, yet realistic, scenario. Additional assumptions include the following:

- One piece of equipment generating a reference noise level of 85 dBA (at a 50-foot distance with a 40 percent usage factor) located at the edge of the construction site
- Two pieces of equipment each generating reference noise levels of 85 dBA located 50 feet farther away on the construction site
- Two more pieces of equipment each generating reference noise levels of 85 dBA located 100 feet farther away on the construction site

Table 27-4 provides construction equipment noise levels at various distances, as calculated using the preceding assumptions. This extrapolation is considered conservative because it considers only geometric spreading and does not account for absorption from atmospheric particles, physical topography, or vegetation.

Table 27-4
Construction Equipment Noise Levels versus Distance

Distance from the Construction Site Boundary (feet)	L_{eq} Noise Level (dBA)
50	83
100	79
200	74
400	69
800	63
1,600	58
3,200	52
6,400	46

Notes:
dBA = A-weighted decibel
L_{eq} = equivalent sound pressure level

Source: Data developed using FHWA Roadway Construction Noise Model.

In the absence of a Tehama, Glenn, or Colusa County noise standard for construction activities, DWR's Specification 05-16 was interpreted. Section 01570 of DWR Specification 05-16 indicates that noise levels that exceed 60 dBA in areas where the ambient noise level is less than 60 dBA[3] require temporary sound walls. Therefore, 60 dBA was interpreted as the noise level in which mitigation would be required due to a significant impact.

Vibration generated by construction equipment typically spreads through the ground and diminishes in magnitude with increases in distance. Although effects of ground vibration may be imperceptible at low levels, they may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in structural damage. There is significant potential for impact from construction activities, such as blasting, pile-driving, vibratory compaction, demolition, and drilling or excavation, that occur in proximity to vibration-sensitive structures (FTA, 2006). Vibratory impacts from construction activities were evaluated by examining the presence and extent of these activities and their proximity to vibration-sensitive structures.

Operations and Maintenance

Noise impacts from operation and maintenance of Project facilities were evaluated by comparing the noise levels generated by the Project facility equipment to noise standards that were set by the counties, and by comparing projected noise levels to projected ambient noise levels.

27.3.4 Topics Eliminated from Further Analytical Consideration

Within the Extended and Secondary study areas, no Project-related activities would expose people residing or working in the vicinity of the Project facilities to excessive aircraft-generated noise levels

[3] This noise level is applicable to the Primary Study Area.

because of the distance of existing public airports or private airstrips to the Project facilities. Therefore, potential impacts related to aircraft-generated noise (**Impact Noise-5** and **Impact Noise-6**) are not discussed further for these two study areas. Within the Primary Study Area, a public airport is located near the site of proposed modifications to the GCID Canal railroad siphon (**Impact Noise-5**). Potential impacts related to aircraft-generated noise are discussed for that Project facility only. Because a private airstrip is not located near Project facilities within the Primary Study Area, **Impact Noise-6** is not discussed further.

Although Project construction, operation, and maintenance activities would generate noise, there are no noise-sensitive receptors located within a 0.5-mile radius of the following Project facilities or their associated construction disturbance areas: Sites Reservoir Inundation Area, Sites Dams, Recreation Areas, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Field Office Maintenance Yard, Holthouse Reservoir Complex, Holthouse Reservoir Electrical Switchyard, and Delevan Pipeline Electrical Switchyard. These facilities are, therefore, not evaluated.

27.3.5 Impacts Associated with the No Project/No Action Alternative

27.3.5.1 Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential to exceed established standards has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on noise levels, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to cause increases in existing ambient noise levels. Noise impacts that would occur as a result of the increased population would be managed at the local level (e.g., cities and counties) in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **there would not be a substantial adverse effect** on ambient noise levels within that study area, when compared to Existing Conditions.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Refer to the **Impact Noise-1** discussion. The discussion also applies to groundborne vibration and noise levels.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion regarding the projects that are included in the No Project/No Action Alternative not being located in the Primary Study Area. The discussion also applies to ambient noise levels.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion regarding the projects that are included in the No Project/No Action Alternative not being located in the Primary Study Area. The discussion also applies to ambient noise levels.

Impact Noise-5: Expose People Residing or Working in the Project Area to Excessive Noise Levels (for a Project Located within an Airport Land Use Plan or, Where Such a Plan Has Not Been Adopted, within Two Miles of a Public Airport OR Public Use Airport)

Refer to the **Impact Noise-1** discussion regarding the projects that are included in the No Project/No Action Alternative not being located in the Primary Study Area. The discussion also applies to excessive noise levels.

Impact Noise-6: Expose People Residing or Working in the Project Area to Excessive Noise Levels (for a Project within the Vicinity of a Private Airstrip)

Refer to the **Impact Noise-1** discussion regarding the projects that are included in the No Project/No Action Alternative not being located in the Primary Study Area. The discussion also applies to excessive noise levels.

27.3.6 Impacts Associated with Alternative A

27.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

There would be no direct Project-related construction or maintenance occurring in the Extended Study Area; therefore, no exceedance of established standards would occur and there would be **no impact** on noise levels from construction or maintenance activities in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of San Luis Reservoir would be altered to accommodate Project operation, which would result in more frequent and larger surface water elevation fluctuations at the reservoir than currently occurs there. In addition, Project operation would result in increased water supply reliability to agricultural, municipal, and industrial users, and the wildlife refuges in the Extended Study Area. These operations would not be expected to change existing noise levels. Therefore, there would be **no impact** on noise levels from operations in the Extended Study Area, when compared to both Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Because there would be no direct Project-related construction or maintenance occurring in the Extended Study Area, there would be **no impact** on existing groundborne vibration or noise levels from construction or maintenance activities in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion. The discussion also applies to ambient noise levels.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion. The discussion also applies to ambient noise levels.

27.3.6.2 Secondary Study Area – Alternative A

<u>Construction, Operation, and Maintenance Impacts</u>

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Project operation would affect the flow regime or surface water elevations of many of the facilities in the Secondary Study Area (listed above). However, changes in flow regime or surface water elevations would not be expected to change existing noise levels. Therefore, there would be **no impact** on noise levels from Project operations in the Secondary Study Area, as compared to both Existing Conditions and the No Project Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Refer to the **Impact Noise-1** discussion. The discussion also applies to groundborne vibration and noise levels.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion. The discussion also applies to ambient noise levels.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion. The discussion also applies to ambient noise levels.

Pump Installation at the Red Bluff Pumping Plant

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant. Glenn County exempts construction site sounds between 7:00 a.m. and 7:00 p.m. If construction activities occur outside of the exemption period, they would be conducted in compliance with applicable noise standards. Therefore, construction activities associated with the installation of an additional pump would have a **less-than-significant impact** on noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump operation would also generate noise. However, the pumping plant already has several pumps operating and the addition of one pump would not be expected to generate noise that could be distinguished from existing noise levels. Therefore, operation of an additional pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the removal of sediment from the existing GCID Canal and Red Bluff Pumping Plant intakes, located in Glenn and Tehama counties, respectively. Project-related operational changes at these facilities could result in increased sedimentation at the intakes and consequently require increased rates of sediment removal. Sediment removal activities, which would involve the use of heavy machinery and equipment (such as bulldozers, excavators, dump trucks, and gradalls[4]), would generate noise. It is expected that maintenance activities would occur during the day, between the hours that Glenn County exempts construction site sounds. If maintenance activities occur outside of the exemption period, they would be conducted in compliance with applicable noise standards. Therefore, maintenance activities associated with the removal of sediment from the existing GCID Canal and Red Bluff Pumping Plant intakes would have a **less-than-significant impact** on noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

The installation of an additional pump into an existing bay at the Red Bluff Pumping Plant may generate groundborne vibration and noise. However, these activities would occur during the daytime and would be temporary. Therefore, construction activities at this facility would result in a **less-than-significant** impact at the nearest noise-sensitive receptors, when compared to Existing Conditions and the No Project/No Action Alternative.

[4] Gradalls are hydraulic wheel-mounted backhoes often used with wide buckets for dressing earth slopes.

Pump operation would also generate noise and may generate groundborne vibration. However, the pumping plant already has several pumps operating and the addition of one pump would not be expected to generate noise or vibration that could be distinguished from existing levels. Therefore, operation of an additional pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on groundborne noise and vibration levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant) could also result in groundborne vibration or groundborne noise levels. However, these activities would occur during the daytime and would be temporary. Therefore, maintenance activities would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a substantial permanent increase in ambient noise levels in the Project vicinity above Levels Existing without the Project

There are several residences within a 0.5-mile radius of the GCID Canal Intake facilities. There are three residences located on the opposite side of the river from the Red Bluff Pumping Plant, less than one mile from the Project construction site. In addition, the Sacramento River Discovery Center is located approximately 0.25 mile from the pumping plant.

Construction activities related to installation of an additional pump at the Red Bluff Pumping Plant facility would generate noise that would be temporary, not permanent. Therefore, noise levels from construction would have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Operation of the additional pump at the Red Bluff Pumping Plant would result in a permanent increase in ambient noise levels. However, the pumping plant already has several pumps operating and the addition of one pump would not be expected to generate noise that could be distinguished from existing levels. Therefore, operation of an additional pump at the Red Bluff Pumping Plant would have a **less-than-significant impact** on noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities at the GCID Canal and the Red Bluff Pumping Plant would increase the ambient noise levels at those facilities when the maintenance activities are occurring. Because maintenance activities would be required throughout the life of the Project, and those activities would generate noise, that noise is considered a long-term impact. Because the noise emitted from maintenance activities would be intermittent, i.e., lasting only as long as the activity occurred, the maintenance activities would not result in a permanent increase in noise levels. Therefore, Project maintenance activities would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary OR Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Refer to the **Impact Noise-1** discussion**.** The discussion also applies to ambient noise levels.

27.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Modeling results presented in Table 27-3 indicate that noise-sensitive receptors would be subjected to noise levels from construction ranging from 83 dBA at 50 feet from the construction site boundary to

52 dBA at 3,200 feet. At 0.5 mile (the boundary for the area of influence for noise impacts), construction noise would attenuate to approximately 55 dBA. Noise levels resulting from construction and operation activities could disturb adjacent uses if noise-sensitive receptors are located within this range of distances.

The sources of noise associated with construction, operation, and maintenance of the Road Relocations and South Bridge, GCID Canal Facilities Modifications, TRR and associated facilities, Delevan Pipeline and Transmission Line, Delevan Pipeline Intake Facilities, and Project Buffer, as well as distances from those facilities to the nearest noise-sensitive receptors located within a 0.5-mile radius, are described below.

Road Relocations and South Bridge

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Glenn County and Colusa County do not have a noise ordinance. Glenn County exempts construction site sounds between 7:00 a.m. and 7:00 p.m. Noise emitted from construction activities associated with the road relocations and the new South Bridge would exceed DWR's Specification 05-16. Therefore, construction activities would have a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The Colusa County Code restricts noise generated from any developed use to a DNL of 60 dB or less as measured at the nearest residential zoned property. In addition, developed uses must not exceed a median hourly noise level of 50 dBA in daytime and 45 dBA in the nighttime. Project operation would result in a continuation of travel on the existing roads (resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative) and also travel on the new and/or relocated Project roads and the new bridge. Travel on new and/or relocated roads would introduce vehicle noise to areas that do not currently experience traffic noise. Traffic noise levels, although they would increase from Existing Conditions in those areas, are not expected to exceed established standards, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance of the roads and bridge would occur periodically, and would result in travel on the existing, new, and relocated roads and the new bridge. Maintenance activities on the roads and bridge would also generate noise. Maintenance activities associated with the road relocations and the new South Bridge would need to comply with applicable noise standards. By meeting the noise standards, construction activities would have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Project construction ground disturbing activities, such as grading, may generate localized groundborne vibration and noise. Any Project construction groundborne vibration and noise would occur during daytime hours, and would be temporary. No construction activities with the potential for significant impact would occur. Therefore, road and bridge construction would result in a **less-than-significant impact** related to groundborne vibration and noise, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation (i.e., travel on the roads and bridge) would not result in groundborne vibration and noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Typical road and bridge maintenance activities (such as chip sealing, patching, asphalt overlays, repair of guardrails, embankment and/or abutment repair, clearing debris, and safety/maintenance inspections) are not expected to cause groundborne vibration and noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction activities, including associated construction traffic, would be temporary, and therefore, would cause no permanent increase in ambient noise levels in the vicinity of these Project features, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operation and maintenance, the introduction of vehicles onto new roads, relocated existing roads, and the South Bridge would result in a permanent increase in ambient noise levels from vehicle traffic. This would result in a **less-than-significant impact** on the ambient noise levels of those roadways, when compared to Existing Conditions and the No Project/No Action Alternative because there would be no noise-sensitive receptors located within a 0.5-mile radius.

Project operation would result in a continuation of travel on the existing roads (resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative) and also travel on the new and/or relocated Project roads and the new bridge. Travel on new and/or relocated roads would introduce vehicle noise to areas that do not currently experience traffic noise. Traffic noise levels, although they would permanently increase from Existing Conditions in those areas, are not expected to be substantial, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Road and bridge maintenance activities would occur periodically, and would result in travel on the existing, new, and relocated roads and the new bridge. Maintenance activities on the roads and bridge would also generate noise. Maintenance activities would be long-term, but would result in intermittent (not permanent) increases in noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction activities associated with the existing, relocated, and new roads and the South Bridge would be temporary, emitting noise levels of 83 dBA at 50 feet from the construction site boundary to approximately 55 dBA at 0.5 mile (the boundary for the area of influence of noise impacts), resulting in an increase in ambient noise levels in the areas around the roads and bridge.

There are three residences located near to the affected roads: one residence located approximately 0.6 mile east of Sulphur Gap Road, one residence located approximately 0.75 mile east of Sulphur Gap Road, and one residence located approximately 600 feet south of County Road 69/North Road, to the west of the T-C Canal. The first two residences mentioned are beyond the noise impact boundary of 0.5 mile. The residence located south of County Road 69/North Road would experience noise levels of approximately 66 dBA when Project construction work to that road was occurring nearest to the residence. Applying this construction-related noise level to DWR's Specification 05-16 60-dBA limit for requiring sound walls, would result in a **significant impact** on ambient noise levels at that location, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation would result in a continuation of travel on the existing roads and also travel on the new and/or relocated roads and the new bridge. Travel on new and/or relocated roads would introduce vehicle noise to areas that do not currently experience traffic noise. These expected long-term travel patterns would not result in substantial temporary or periodic noise increases, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Road and bridge maintenance activities would occur periodically, and would result in travel on existing, new, and relocated roads and the new bridge. Maintenance activities on the roads and bridge would also generate noise. Maintenance activities would be long-term, and would result in a temporary and periodic increase in noise that would not be substantial, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Glenn-Colusa Irrigation District Canal Facilities Modifications

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Glenn County exempts construction site sounds between 7:00 a.m. and 7:00 p.m. Construction activities that occur outside of the exemption period would comply with applicable noise standards. Due to the County's daytime construction exemption, construction activities would have a **less than-significant-impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation and maintenance activities at the headgate, canal lining, and railroad siphon locations and their associated noise levels are not expected to increase from existing levels because the same noise-generating activities that currently occur along the GCID Canal would continue, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

The temporary bypass channel would be constructed using a combination of excavation, earth embankment, and sheetpile walls to isolate the construction site from the canal. These construction activities are considered to have a potential for impact when occurring in proximity to vibration-sensitive structures. There are several existing residences within 0.25 mile of the proposed headgate and canal lining location, and several more within a 0.5-mile radius of those Project facilities. The railroad siphon that would be replaced would be located adjacent to several neighborhoods in the City of Willows. Therefore, construction activities would result in **potentially significant impact** on groundborne vibration and noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation and maintenance activities at the headgate, canal lining, and railroad siphon locations are not expected to cause groundborne vibration or noise that would differ from existing levels because the same noise-generating activities that currently occur along the GCID Canal would continue, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Project construction activities at these locations would not permanently increase ambient noise levels there, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation and maintenance activities at these locations and their associated noise levels are not expected to increase substantially from existing levels because the same noise-generating activities that currently occur along the GCID Canal would continue, resulting in a **less-than-significant impact** on ambient noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Required maintenance activities would be very similar to current maintenance; however, dredging of the Intake Channel would now occur periodically throughout the year instead of every three years. The intake and fish screen facility would operate year-round and would be very similar to existing operations. Therefore, operation and maintenance activities would result in a **less-than-significant impact** on ambient noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Project construction activities associated with the proposed GCID Canal Facilities Modifications would be temporary, generating noise levels of approximately 78 to 83 dBA at 50 feet (approximately 61 dBA at 0.25 mile). This would result in a **potentially significant impact** on ambient noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the GCID Canal Facilities Modifications would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance of the GCID Canal Facilities Modifications would be a long-term impact that would result in a temporary and periodic increase in noise levels that would not be substantial. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-5: Expose People Residing or Working in the Project Area to Excessive Noise Levels (for a Project Located within an Airport Land Use Plan or, Where Such a Plan Has Not Been Adopted, within Two Miles of a Public Airport or Public Use Airport)

The Willows-Glenn County Airport is located approximately 1.3 miles from the railroad siphon that would be replaced during the GCID Canal Facilities modifications. However, Project construction workers and operations/maintenance personnel would be provided OSHA-approved hearing protection, if necessary. Therefore, exposure to airport-associated noise levels would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Colusa County does not have a noise ordinance. However, noise emitted from construction activities associated with the TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, and TRR Pipeline Road would exceed DWR's Specification 05-16. Therefore, construction activities would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The operation of the proposed TRR and its associated facilities would result in operation of noise-generating stationary equipment, including a pumping plant and emergency generators. This operational noise would be a change from the noise that is currently generated at the site from its existing agricultural practices. Vendor-specific noise information is not currently available for the equipment needed to operate the TRR. However, it is possible that the generated noise levels would exceed established standards, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities associated with sediment removal and disposal at the TRR and the pump operation could result in an increase in ambient noise levels. However, these activities are expected to result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Construction activities (e.g., transport of materials to the Project site, clearing and grading the construction work space, staging of construction materials, dewatering, and excavation and embankment construction) associated with the construction of the TRR and its associated facilities may generate groundborne vibration and noise. These construction activities would result in a **potentially significant impact,** when occurring in proximity to the nearest residence, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities associated with sediment removal and disposal and the Project's pump operation could also result in groundborne vibration or groundborne noise levels. However, these activities would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction activities associated with the TRR and its associated facilities would result in temporary impacts, not permanent impacts, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The long-term operation and maintenance of the proposed TRR and its associated facilities would result in operation of noise-generating stationary equipment, including a pumping plant and emergency generators. This would be a change from the noise that is currently generated at the site from its existing agricultural practices. Vendor-specific noise information is not currently available for operation and maintenance equipment. However, it is possible that the noise levels that would be generated would result in a **potentially significant impact** on ambient noise levels at the nearest noise-sensitive receptor (a residence), when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

The construction of the TRR and its associated facilities would require excavation, transport, stockpiling, and grading. Construction equipment would generate noise levels between 80 and 85 dBA at a 50-foot distance (i.e., the nearest noise-sensitive receptor). This would result in a temporary **significant impact** on ambient noise levels during Project construction, particularly when working within the northeast corner of the TRR, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of the proposed TRR and its associated facilities would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance of the proposed TRR and its associated facilities would be a long-term impact that would result in a temporary and periodic increase in noise levels that would not be substantial. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline and Delevan Transmission Line

The Delevan Transmission Line would parallel and overlap with the construction disturbance area of the Delevan Pipeline from the Delevan Pipeline Intake Facilities to the TRR. The transmission line and pipeline would then diverge as their alignments would continue west of the TRR to other Project facilities. There are no noise-sensitive receptors located within a 0.5-mile radius of the divergence area. This impact analysis, therefore, focuses on the segments of the Delevan Pipeline and Transmission Line that are located between the Delevan Pipeline Intake Facilities and the TRR. There are approximately 49 residences located within the construction disturbance area of the Delevan Pipeline and Transmission Line. The nearest residence that was identified for the TRR is also located within these facilities' construction disturbance area.

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Colusa County does not have a noise ordinance. Noise emitted from construction activities associated with the Delevan Pipeline and Delevan Transmission Line would exceed DWR's Specification 05-16. Therefore, Delevan Pipeline and Delevan Transmission Line construction activities would have a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The long-term operation of the proposed Delevan Pipeline would generate only minimal noise at the aboveground blow-off structures and air valve structures, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Maintenance of the proposed pipeline would consist of periodic inspections and maintenance as needed, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The long-term operation and maintenance of the proposed Delevan Transmission Line would result in noise generated from two sources: the transmission line would emit a “hum”, and periodic maintenance trips to the individual transmission line towers by inspection vehicles would emit vehicle noise. These noise sources would not be expected to exceed applicable noise standards and would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Construction activities (e.g., ground disturbing activities, including excavation and movement of heavy construction equipment) associated with the installation of the pipeline may generate groundborne vibration and noise. These construction activities would result in a **potentially significant impact**, when in proximity to noise-sensitive receptors (residences), when compared to Existing Conditions and the No Project/No Action Alternative.

Construction activities associated with installation of the proposed transmission line (clearing, grading, delivering construction materials at the staging areas, excavating tower footings, erecting the towers, and stringing the conductor) are not expected to generate groundborne vibration or noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the pipeline and transmission line would require no ground disturbing activities and would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction of the Delevan Pipeline would require dewatering, as well as trenching of soils and alluvial material down to the design depth. Construction of the Delevan Transmission Line would require the construction of a temporary access road along the alignment and soil excavation for tower footings. Construction equipment would generate noise levels between 80 and 85 dBA at a 50-foot distance. However, these activities would be temporary, not permanent, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The long-term operation of the proposed Delevan Pipeline would generate minimal noise at the above-ground blow-off structures and air valve structures, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The long-term operation of the proposed Delevan Transmission Line would result in noise generated from two sources: the transmission line would emit a “hum”, and periodic maintenance trips to the individual transmission line towers by inspection vehicles would emit vehicle noise. These noise sources would not cause a substantial permanent increase in ambient noise levels, and would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance of the proposed pipeline and transmission line would generate noise from vehicles and equipment on a periodic and temporary basis, not permanently. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction activities associated with the Delevan Pipeline and Transmission Line would result in temporary increases in noise, emitting noise levels of between 80 and 85 dBA at a 50-foot distance, which would attenuate to approximately 55 dBA at 0.5 mile. This would result in a **significant impact** on the residences located within the construction disturbance area of the pipeline and transmission line, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations activities would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would be a long-term impact that would result in a temporary and periodic increase in noise levels that would not be substantial. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Colusa County does not have a noise ordinance. However, noise emitted from construction activities associated with the Delevan Pipeline Intake Facilities would exceed DWR's Specification 05-16. Therefore, construction activities would have a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities would involve the long-term operation of noise-generating stationary equipment, including the pumping plant, mechanical cleaning mechanisms on fish screens, and emergency generators. Noise is currently generated near the site from the existing adjacent Maxwell Irrigation District Pumping Plant. Vendor-specific noise information is not currently available for the equipment needed to operate this Project facility. However, it is possible that the generated noise levels would exceed established standards, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Construction of the Delevan Pipeline Intake Facilities would require the use of a vibratory pile driver to install a cofferdam. Because the nearest residence is located approximately 0.3 mile away from the intake facility footprint, groundborne vibration or groundborne noise levels are not expected to be excessive, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the Delevan Pipeline Intake Facilities would not involve the use of equipment that would emit groundborne vibration or noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction of the proposed Delevan Pipeline Intake Facilities would result in temporary impacts, not permanent impacts on noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation would involve the long-term operation of noise-generating stationary equipment, including the pumping plant, mechanical cleaning mechanisms on fish screens, and emergency generators. Noise is currently generated near the site from the existing adjacent Maxwell Irrigation District Pumping Plant. Vendor-specific noise information is not currently available for the equipment needed to operate this Project facility. However, ambient noise levels are expected to increase, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would generate noise from vehicles and equipment on a periodic and temporary basis, not permanently. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

The construction of the Delevan Pipeline Intake Facilities would require installation of a cofferdam within the Sacramento River; dewatering, clearing and grading the construction workspace; excavating soils and alluvium from the forebay, afterbay, and pumping plant sites; construction of the levee, pump house, pump bays, forebay structure, and fish screens; and filling and re-grading, where needed. Modeling results presented in Table 27-4 indicate that noise-sensitive receptors would be subjected to noise levels from construction of approximately 58 dBA at 0.3 mile. Therefore, noise levels from construction would have **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations activities would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would be a long-term impact that would result in a temporary and periodic increase in noise levels that would not be substantial. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Within the Project Buffer, a fence would be constructed, several existing structures would be demolished, and a fuelbreak would be created. Glenn County and Colusa County do not have a noise ordinance. Glenn County exempts construction site sounds between 7:00 a.m. and 7:00 p.m. Noise generated from fence construction is not expected to exceed DWR’s Specification 05-16; however, noise emitted from demolition activities and fuelbreak discing may. Therefore, construction activities would have a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance activities, including fence and fuelbreak maintenance, would generate noise (particularly fuelbreak work), resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Construction of a fence, demolition of structures, and creation of a fuelbreak within the Project Buffer would not generate groundborne vibration or groundborne noise. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, operation and maintenance activities (including fence and fuelbreak maintenance) would not generate groundborne vibration or groundborne noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction and demolition activities would result in temporary impacts, not permanent impacts, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations activities would be long-term, resulting in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would be long-term, and would not result in a permanent increase in ambient noise levels, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction and demolition activities would result in temporary noise impacts, resulting in a **less-than-significant impact** at noise-sensitive receptors, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations activities would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would be a long-term impact that would result in a temporary and periodic increase in noise levels. Noise levels associated with fence maintenance would not be substantial, resulting in **a less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative. However, fuelbreak maintenance would result in a **potentially significant impact** to ambient noise levels, when compared to Existing Conditions and the No Project/No Action Alternative.

27.3.7 Impacts Associated with Alternative B

27.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to excessive noise levels (**Impact Noise-1**), excessive groundborne vibration or noise levels (**Impact Noise-2**), permanent increases in ambient noise levels (**Impact Noise-3**), and temporary or periodic increases in ambient noise levels (**Impact Noise-4**), would be the same as described for Alternative A for the Extended and Secondary study areas.

27.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to noise:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

Alternative B includes the construction of a 1.81-MAF reservoir. The increased reservoir size necessitates the addition of two saddle dams and the movement of various associated Project features. However, similar to Alternative A, there are no noise-sensitive receptors located within a 0.5-mile radius of these facilities.

The Alternative B Delevan Transmission Line would differ from Alternative A. Alternative B includes no transmission line alignment between the Sacramento River and the WAPA or PG&E transmission lines. The transmission line would be approximately three miles long, from the proposed Sites Electrical Switchyard to the WAPA or PG&E transmission line, which are located west of the TRR. However, similar to Alternative A, there are no noise-sensitive receptors located within a 0.5-mile radius of this construction disturbance area.

The Alternative B Road Relocations and South Bridge would differ slightly from those described for Alternative A. The lengths of the saddle dam access roads included in Alternative A would be reduced in Alternative B because the dams would be larger and would be located closer to the main roads. In addition, an extension of an access road would be constructed for Alternative B to provide access from Saddle Dam 3 to saddle dams 1 and 2. However, there are no noise-sensitive receptors located within a 0.5-mile radius of these portions of the road relocations. Construction activities along the Road 69 segment of the North Road in the vicinity of a residence would have the same impact on excessive noise levels (**Impact Noise-1**), excessive groundborne vibration or noise levels (**Impact Noise-2**), permanent increases in ambient noise levels (**Impact Noise-3**), and temporary or periodic increases in ambient noise levels (**Impact Noise-4**) as described for Alternative A.

The size of the Alternative B Project Buffer would differ from that of Alternative A because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives. However, the boundary of the Project Buffer would be the same for Alternatives A and B and would be the same distance from noise-sensitive receptors as described for Alternative A. In addition, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. The Project Buffer would, therefore, have the same impact on excessive noise levels (**Impact Noise-1**), excessive groundborne vibration or noise levels (**Impact Noise-2**), permanent increases in ambient noise levels (**Impact Noise-3**), and temporary or periodic increases in ambient noise levels (**Impact Noise-4**) as described for Alternative A.

Alternative B would replace the Delevan Pipeline Intake Facilities with the Delevan Pipeline Discharge Facility. The Delevan Pipeline would be operated as a release-only pipeline, so the associated Delevan Pipeline Discharge Facility would, therefore, not include a fish screen or any of the facilities needed for the pumping and generating operations that were described for Alternative A. The construction, operation, and maintenance impacts on noise levels from this facility are discussed below.

Delevan Pipeline Discharge Facility

The proposed Delevan Pipeline Discharge Facility would be smaller than the Delevan Pipeline Intake Facilities included in Alternative A. The proposed Discharge Facility would also have fewer Project features, which would result in a shorter construction time frame for this facility, when compared to the facility included in Alternative A.

Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards

Construction of the Delevan Pipeline Discharge Facility would require installation of a cofferdam within the Sacramento River; dewatering, clearing, and grading the construction workspace; excavation of the bank and backfilling the area for the spillway, channel, and valve house; construction of the setback level and slurry walls, valve house, channel, and spillway; and placing rip rap rock slope protection along the river bank.

Colusa County does not have a noise ordinance. However, noise emitted from construction activities associated with the Delevan Pipeline Discharge Facility would exceed DWR's Specification 05-16. Therefore, construction activities would have a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Operation and maintenance activities would involve the long-term operation of noise-generating stationary equipment. Noise is currently generated near the site from the existing adjacent Maxwell Irrigation District Pumping Plant. Vendor-specific noise information is not currently available for the equipment needed to operate this Project facility. However, it is possible that the generated noise levels would exceed established standards, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels

Construction of the Delevan Pipeline Discharge Facility would require the use of a vibratory pile driver to install a cofferdam. Because the nearest residence is located approximately 0.3 mile away from the facility footprint, groundborne vibration or groundborne noise levels are not expected to be excessive, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the Delevan Pipeline Discharge Facility would not involve the use of equipment that would emit groundborne vibration or noise, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

Construction equipment would generate noise that would be temporary, not permanent. Therefore, noise levels from Project construction would have **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Project operation would involve the long-term operation of noise-generating stationary equipment. Noise is currently generated near the site from the existing adjacent Maxwell Irrigation District Pumping Plant. Vendor-specific noise information is not currently available for the equipment needed to operate this Project facility. However, ambient noise levels are expected to increase, resulting in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would generate noise from vehicles and equipment on a periodic and temporary basis, not permanently. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity above Levels Existing without the Project

The nearest residence is located approximately 0.3 mile northwest of the Delevan Pipeline Discharge Facility footprint.

The construction of the Delevan Pipeline Discharge Facility would require installation of a cofferdam within the Sacramento River; dewatering, clearing and grading the construction workspace; excavating soils; construction of the levee; and filling and re-grading, where needed. Modeling results presented in Table 27-4 indicate that noise-sensitive receptors would be subjected to noise levels from construction of approximately 58 dBA at 0.3 mile. Therefore, noise levels from construction would have **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operations activities would be a long-term impact, not a temporary or periodic increase in noise levels. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maintenance activities would be a long-term impact that would result in a temporary and periodic increase in noise levels that would not be substantial. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

27.3.8 Impacts Associated with Alternative C

27.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to excessive noise levels (**Impact Noise-1**), excessive groundborne vibration or noise levels (**Impact Noise-2**), permanent increases in ambient noise levels (**Impact Noise-3**), and temporary or periodic increases in ambient noise levels (**Impact Noise-4**), would be the same as described for Alternative A for the Extended and Secondary study areas.

27.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to noise:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would be located the same distance from noise-sensitive receptors as described for Alternative A. They would, therefore, result in the same construction, operation, and maintenance impacts to noise as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Sites Reservoir Dams is the same as described for Alternative B. Therefore, there are no noise-sensitive receptors located within a 0.5-mile radius of these proposed facilities. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to land use as described for Alternative B.

The Alternative C design of the Road Relocations, South Bridge, TRR Pipeline Road, and the Electrical Distribution Lines is the same as described for Alternative B. Therefore, they would be located the same distance from noise-sensitive receptors as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to noise as described for Alternative B.

The boundary of the Project Buffer would be the same for all alternatives, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact have the same impact on excessive noise levels (**Impact Noise-1**), excessive groundborne vibration or noise levels (**Impact Noise-2**), permanent increases in ambient noise levels (**Impact Noise-3**), and temporary or periodic increases in ambient noise levels (**Impact Noise-4**) as described for Alternative A.

27.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 27-5 for the impacts that have been identified as significant or potentially significant.

Table 27-5
Summary of Mitigation Measures for
Potential NODOS Project Impacts to Noise

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Noise-1: Expose Persons to or Generation of Noise Levels in Excess of Established Standards	Road Relocations and South Bridge, TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline, Delevan Transmission Line, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility (construction)	Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant

Table 27-5
Summary of Mitigation Measures for
Potential NODOS Project Impacts to Noise

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Project Buffer (construction)	Potentially Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
	TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Intake Facilities, Project Buffer, Delevan Pipeline Discharge Facility (operation)	Potentially Significant	Mitigation Measure Noise-1b: Design Facilities to Incorporate Noise Mitigation	Less than Significant
	Delevan Pipeline Intake Facilities, Project Buffer, Delevan Pipeline Discharge Facility (maintenance)	Potentially Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
Impact Noise-2: Expose Persons to or Generation of Excessive Groundborne Vibration or Groundborne Noise Levels	GCID Canal Facilities Modifications, TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline, (construction)	Potentially Significant	Mitigation Measure Noise-2: Develop and Implement a Vibration Monitoring Plan	Less than Significant

Table 27-5
Summary of Mitigation Measures for
Potential NODOS Project Impacts to Noise

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Noise-3: Result in a Substantial Permanent Increase in Ambient Noise Levels in the Project Vicinity Above Levels Existing without the Project	TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Intake Facilities, Delevan Pipeline Discharge Facility (operation)	Potentially Significant	Mitigation Measure Noise-1b: Design Facilities to Incorporate Noise Mitigation	Less than Significant
	TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, (maintenance)	Potentially Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
Impact Noise-4: Result in a Substantial Temporary or Periodic Increase in Ambient Noise Levels in the Project Vicinity Above Levels Existing without the Project	Road Relocations and South Bridge, TRR, GCID Canal Connection to the TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline, Delevan Transmission Line, (construction)	Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
	GCID Canal Facilities Modifications, (construction)	Potentially Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant
	Project Buffer (maintenance)	Potentially Significant	Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels	Less than Significant

LOS = Level of Significance

Mitigation Measure Noise-1a: DWR and Reclamation Shall Include in the Construction and Maintenance Contracts Specifications to Reduce Noise Levels

DWR and Reclamation shall include in both the construction and maintenance contracts the specifications indicating the requirements listed below. DWR's and Reclamation's intent is that all Project construction noise-related impacts at noise-sensitive receptor property boundary lines be minimized or eliminated completely to the extent feasible, and/or that construction noise levels at noise-sensitive receptor property boundary lines not exceed 60 dBA. The construction contractor may propose other methods to sufficiently reduce construction noise levels if it can be demonstrated that those methods are implementable and suitable for the particular location and situation:

- **Local requirements.** Project construction and maintenance activities shall follow local requirements to the extent possible.
- **Portable barriers.** Portable barriers shall be used to shield noise from compressors and other small stationary equipment used during Project construction and/or maintenance if the construction or maintenance activity occurs near a residence.
- **Equipment.** Quiet equipment (for example, equipment that incorporates noise-control elements into the design; compressors can be quiet models) shall be used during Project construction and/or maintenance whenever possible. Preventive maintenance on equipment, including practicable methods and devices to control, prevent, and minimize noise, shall be performed on a regular basis. To the extent feasible, portable and stationary equipment shall be located, stored, and maintained as far as possible from nearby residents.
- **Exhaust.** Equipment exhaust stacks and vents shall be directed away from residential buildings.
- **Truck traffic routing.** Project construction and/or maintenance truck traffic shall be routed away from noise-sensitive areas where feasible. Truck companies that would transport Project construction equipment and/or materials shall be informed that air braking along haul routes where there are residences shall be prohibited.
- **Construction activity scheduling.** To the extent feasible, Project construction activities shall be scheduled so that the activities that are the noisiest occur when ambient noise is also at its peak.
- **Residential notification.** DWR and Reclamation shall notify residents near the Project facility site(s) of the timeframe for Project construction and maintenance activities. In addition, DWR and Reclamation shall notify residents near the Project facility site(s) if nighttime Project construction and/or transportation/delivery of construction vehicles, equipment, or materials is necessary. Such notification would occur prior to such activities occurring.
- **Addressing noise complaints.** If complaints from residents that are located near Project facility locations are received due to nighttime Project construction activities, the construction contractor shall monitor construction noise levels at the property line of the affected residence(s). If the construction noise exceeds the applicable noise standard, the responsible construction activity shall cease until feasible measures are implemented to reduce nighttime noise levels.

Mitigation Measure Noise-1b: Design Facilities to Incorporate Noise Mitigation

During Project design, all facilities shall be designed to incorporate noise-reducing features to comply with applicable noise regulations and/or guidelines. Noise-reducing features could include, but are not limited to, acoustically rated wall, ceiling, and door assemblies, and silenced building ventilation; and acoustical treatments on above-ground piping and valving.

Mitigation Measure Noise-2: Develop and Implement a Vibration Monitoring Plan

During Project design, a vibration monitoring plan shall be prepared for construction activities that would require pile driving or excavation. The plan shall be implemented during Project construction to ensure that no vibration-related damage is caused by Project-related construction activities.

Implementation of **Mitigation Measures Noise-1a, Noise-1b,** and **Noise-2** would reduce the level of significance of Project impacts to noise to **less than significant**.

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28. Public Health and Environmental Hazards

28.1 Introduction

This chapter describes hazardous materials and other environmental hazards, such as wildland fires and mosquito/vector-borne illnesses that present risks to human health or the environment within the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Other hazards, such as flooding, dam failure, and issues related to public services (e.g., fire protection, law enforcement, emergency services), are addressed in other chapters in this DEIR/EIS.

The regulatory setting for public health and environmental hazards is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

28.2 Environmental Setting/Affected Environment

28.2.1 Extended Study Area

28.2.1.1 Hazardous Materials

Hazardous materials are defined in Section 66260.10, Title 22, of the California Code of Regulations as:

> A substance or combination of substances which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either (1) cause, or significantly contribute to, an increase in mortality or an increase in serious, irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of or otherwise managed.

In addition, California Health and Safety Code Section 25501 defines a hazardous material as follows:

> Any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. “Hazardous materials” include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or environment.

“Hazardous wastes” are defined in the California Health and Safety Code Section 25141(b) as wastes that:

> …because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness [or] pose a substantial present or potential hazard to

human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Hazardous materials contamination throughout the Extended Study Area has resulted from a variety of activities. These activities include the following influences:

- Agriculture operations that include the storage and application of pesticides, herbicides, and fertilizers, and production activities in farming operations
- Urban land uses that generate, store, or transport hazardous materials in the industrial, commercial, and residential setting on both land and water
- Historic mining operations

Potential sources of hazardous material and waste that may exist in the agricultural, urban, and historic mining areas throughout the Extended Study Area may be present in a variety of common contexts, including:

- Petroleum hydrocarbons
- Landfills or solid waste disposals sites
- Volatile organic carbons
- Wastewater and wastewater treatment plants
- Herbicide, insecticides, fungicides, and other pesticides
- Contaminated aggregate (such as mercury-contaminated)
- Underground storage tanks
- Stormwater runoff structures
- Utility poles
- Abandoned mines

Superfund is the name given to the national environmental program that was established to address abandoned hazardous waste sites. It is also the name of the fund established by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. This law was enacted because of the discovery of toxic waste dumps. California has 94 Superfund sites; there are designated Superfund sites in 26 of the counties included in the Extended Study Area. DTSC oversees the State Superfund sites and also administers the USEPA Brownfields Program. It strives to clean up and redevelop potentially contaminated lands, making it easier for such lands to become functioning parts of their communities. California has 67 Brownfields sites statewide; there are designated Brownfields sites in 11 of the counties included in the Extended Study Area. Refer to Appendix 28A for a list of Superfund and Brownfields sites throughout California (USEPA, 2013).

In addition to the hazardous material contamination issues noted above (agriculture and mining), the following are also areas of concern: quarries, railroads, and private water wells and septic systems.

28.2.1.2 Wildland Fires

Wildland fires pose a hazard to rural and urban development, infrastructure, and natural resources. Numerous factors, such as topography, vegetation characteristics, fuel load, and climate contribute to the degree of fire hazard throughout the State. Based on a review of the California Department of Forestry and Fire Protection's (CAL FIRE) statewide map of fire hazard severity zones, the CVP and SWP service areas within the Extended Study Area include lands designated with a fire hazard severity ranging from moderate to very high. In general, the service areas located in the lower foothills that surround the Central Valley include lands designated as moderate risk; the service areas located in the San Francisco Bay area and in the adjacent East Bay and coastal counties include lands designated as high risk; and the service areas located in Shasta County, in southern California, and in the higher elevations of Tehama County and the eastside counties include lands designated as very high risk for wildland fire (CAL FIRE, 2007a). All of these areas also include identified communities at risk from wildlfire. Communities at risk from wildfire are those located within 1.5 miles of areas of high or very high risk for wildland fire (CAL FIRE, 2001).

28.2.1.3 Mosquitoes, Other Vectors, and Nuisance Problems

Mosquitoes

Several species of mosquitoes are common in California. Each species has a season when it is most active. Depending on the California region, some species may be active during most or all of the year. Each mosquito species has a range of preferred hosts, and most species feed on more than one type of host. Mosquitoes have blood meal hosts that range from reptiles, amphibians, mammals, birds, to humans. Protein from a host’s blood is used by the female mosquito to produce eggs.

Mosquitoes carry diseases that afflict humans. They also transmit several diseases and parasites that dogs, birds, and horses are susceptible to. These diseases include protozoan diseases, such as malaria and dog heartworm, and viruses such as West Nile virus and Eastern equine encephalitis[1] (AMCA, 2013).

Mosquito breeding habitat is briefly characterized below to aid in understanding how mosquito-borne diseases are spread. According to a white paper written by the Society of Wetland Scientist (SWS, 2009), female mosquitoes can be classified into two general groups based on their egg-laying and hatching behavior, namely, the floodwater habitat mosquitoes or the permanent aquatic habitat mosquitoes.

Floodwater mosquito eggs are deposited on moist substrate and do not hatch until subsequently inundated. They include mosquitoes in the genera *Aedes*, *Anopheles*, and *Ochlerotatus* that are primarily daytime mosquitoes. These mosquitoes can be significant vectors for diseases.

Permanent aquatic habitat female mosquitoes lay eggs on stagnant warm water surfaces, which hatch after three to five days. Mosquitoes in the genera *Culex*, *Culisteta*, and *Orthopodomyia* are included in this group. Many species in this group are active at dusk and can feed on both humans and livestock. Conditions conducive to permanent aquatic habitat are shallow stagnant ponds with emergent vegetation, standing rain puddles, and poorly drained or flooded agricultural fields.

The mosquito species that are found within the counties that comprise the Extended Study Area are listed in Table 28-1.

Other Vectors and Nuisance Problems

Stinging Insects

Stringing insects, such as bees, yellowjackets, paper wasps, and stinging ants (all found within the Extended Study Area), can cause injury to humans ranging from sharp temporary pain to anaphylaxis shock leading to death. Stinging insects can be divided into social (those that live in colonies) and non-social (Mussen, 2011a). Non-social stinging insects are individual insects that tend to avoid human contact by fleeing. Social stinging insects include the western yellowjacket (*Vespula pennsylvanica*), the

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[1] Dengue and yellow fever are also mosquito-vectored diseases; however, they have not been reported in California. Yellow fever occurs only in tropical areas of Africa and the Americas (AMCA, 2013).

German yellowjacket (*Vespula germanica*), the prairie yellowjacket (*Vespula atropilosa*), the European honey bee (*Apis mellifera*), and fire ants (*Solenopsis* spp.). The red imported fire ant (*Solenopsis invicta)* is particularly aggressive and can cause injury and damage to humans, crops, and livestock. Generally, social stinging insects are not aggressive to humans unless perceived as a threat to their nest and foraging activities (Mussen, 2011a and 2011b). In addition, stinging insects are attracted to food sources such as trash receptacles, outdoor cooking areas, and picnic areas.

European honey bees are used by beekeepers in California for honey production and crop pollination although they are non-native to the Americas. Several different subspecies of the European honey bee now exist throughout the United States. The Africanized honey bee[2] has been in California since 1994 (LACWVCD, 2011). Africanized honey bees have colonized in the Extended Study Area in Kings, Madera, San Luis Obispo, Santa Barbara, and Tulare counties.

Yellowjackets and paper wasps are beneficial insects. Yellowjackets and the European paper wasp are often confused, but have distinct differences. Most of the time, yellowjackets are not aggressive and will not harm humans if they stay out of their way. European paper wasps are more easily provoked than other wasps, and will more readily sting when someone nears their nest. In the summer months, foraging yellowjackets may become a nuisance in parks, campgrounds, and other areas. Paper wasps may become a nuisance when they build a nest on or near homes (SYMVCD, 2011).

Stinging ants are non-native but were found in California in 1997. Since then, they have rapidly spread throughout central and southern California and because of their potential for substantial injury and damage to humans, crops, and livestock, several southern California counties (Riverside, Orange, Los Angeles, and San Diego) have established quarantines to confine further spreading (Jetter et al., 2002).

Ticks, Liver Flukes, and Conenose Bugs

Ticks are small insect-like creatures most often found in naturally vegetated areas. They feed by attaching to animals and humans, sticking their mouthparts into the skin, and sucking blood for up to several days. Ticks can be vectors for disease, particularly Lyme disease. Ticks have four life cycle stages: egg, larva, nymph, and adult. Only the nymph and adult ticks can transmit the bacteria that eventually cause Lyme and other diseases (Lane, 2008).

There are 47 species of ticks in California, but only six species are known to commonly bite humans (Lane, 2008). Although the western black-legged tick (*Ixodes pacificus*) is the only species that carries the bacteria which cause Lyme disease, other diseases can be transmitted by the other human-biting ticks. For example, Rocky Mountain spotted fever can be transmitted by the American dog tick (*Dermacentor variabilis)* and the Rocky Mountain wood tick (*Dermacentor andersoni).* Bacteria causing Colorado tick fever and Tularemia can be transmitted by the Pacific Coast tick (*Dermacentor occidentalis*) (Lane, 1990).

[2] The Africanized honey bee is a cross-breed of the African honey bee and the European honey bee.

Table 28-1
Distribution of Mosquitoes in Counties that Comprise the Extended Study Area

County	Mosquito Species: Aedes		Ochlerotatus																					
	hemiteleus	vexans	bicristatus	campestris	cataphylla	deserticola	dorsalis	fitchii	flavescens	hexodontus	Increpitus complex	melanimon	nigromaculis	niphadopsis	pullatus	purpureipes	schizopinax	sierrensis	squamiger	sticticus	taeniorhynchus	tahoensis	thelcter	ventrovittis
Alameda[a]		x					x				x		x					x	x					
Butte[a]		x									x	x	x					x				x		
Calaveras			x				x			x	x		x					x				x		x
Colusa[b]		x					x				x	x	x					x		x				
Contra Costa[a]		x					x				x	x	x					x	x					
El Dorado[a]	x	x	x		x			x		x	x	x	x				x	x				x		x
Fresno	x	x			x			x		x	x	x	x		x			x				x		x
Glenn[b]		x										x	x					x						
Imperial		x					x						x			x					x		x	
Kern		x					x			x		x	x					x						
Kings		x										x	x					x						
Los Angeles						x	x				x		x					x	x		x			
Madera		x								x	x	x	x					x		x		x		x
Merced		x					x				x	x	x					x		x				
Monterey							x				x		x					x	x					
Napa			x				x				x		x					x	x					
Nevada	x				x			x		x	x		x				x	x				x		x
Orange											x	x	x					x	x		x			
Placer[a]	x	x	x		x			x		x	x	x	x				x	x				x		x
Plumas	x	x		x	x		x	x		x	x	x	x	x			x	x				x		x
Riverside		x				x	x				x	x	x			x		x	x		x		x	
Sacramento[a]		x	x				x				x	x	x					x		x				
San Benito													x					x	x					
San Bernardino		x				x	x				x	x	x			x		x						
San Diego						x	x				x		x					x	x		x			
San Joaquin		x	x				x				x	x	x					x		x				
San Luis Obispo							x				x		x					x	x					
Santa Barbara							x				x	x	x					x	x		x			
Santa Clara[a]							x				x		x					x	x					
Santa Cruz							x				x							x						
Shasta[a]	x	x			x		x	x	x	x	x	x	x					x		x		x		x
Solano[a]		x					x				x	x	x					x	x					
Stanislaus		x					x				x	x	x					x		x				
Sutter[a]		x					x				x	x	x					x		x				
Tehama[a]	x	x			x			x		x	x	x	x					x		x		x		
Tulare		x			x					x	x	x	x		x			x				x		x
Tuolumne		x			x			x		x	x				x			x		x		x		x
Ventura							x				x							x	x		x			
Yolo[a]		x									x	x	x					x		x				

County	Mosquito Species: Anopheles					Culex												Culiseta				Others				
	franciscanus	freeborni	hermsi	occidentalis	punctipennis	anips	apicalis	boharti	erraticus	erythrothorax	pipiens/quinque	reevesi	restuans	stigmatosoma	tarsalis	territans	thriambus	impatiens	incidens	inornata	particeps	Cq. perturbans	Or. signifera	Ps. columbiae	Ps. signipennis	Ur. anhydor
Alameda[a]	x	x		x	x		x	x		x	x			x	x				x	x	x					
Butte[a]	x	x			x		x	x		x	x			x	x	x	x		x	x	x	x	x			
Calaveras	x	x			x		x	x		x				x	x				x	x	x	x	x			
Colusa[b]	x	x			x					x	x			x	x				x	x						
Contra Costa[a]	x	x		x	x		x	x		x	x			x	x		x		x	x	x		x			
El Dorado[a]	x	x			x		x				x			x	x	x	x	x	x	x	x					
Fresno	x	x			x		x			x	x		x	x	x		x		x	x	x	x	x			
Glenn[b]	x	x					x	x		x	x			x	x		x		x	x						
Imperial	x	x							x	x	x			x	x				x	x	x			x	x	
Kern	x	x			x		x	x		x	x		x	x	x		x		x	x	x	x	x			
Kings	x	x			x						x			x	x				x	x			x			
Los Angeles	x		x				x	x		x	x		x	x	x		x		x	x	x		x			
Madera	x	x			x					x	x			x	x		x		x	x						
Merced	x	x			x		x	x		x	x			x	x		x		x	x	x	x	x			
Monterey	x	x		x	x		x	x		x	x	x	x	x	x		x		x	x	x					
Napa	x	x		x	x		x	x		x	x			x	x		x		x	x	x					
Nevada	x	x			x		x	x		x	x			x	x	x	x		x	x						
Orange	x		x				x	x		x	x		x	x	x		x		x	x	x					
Placer[a]	x	x			x		x	x		x	x			x	x	x	x		x	x	x	x				
Plumas	x	x			x		x							x	x	x		x	x	x		x				
Riverside	x	x	x				x		x	x	x		x	x	x		x		x	x	x		x	x	x	
Sacramento[a]	x	x			x		x	x		x	x			x	x		x		x	x	x	x	x			
San Benito	x	x		x			x	x			x			x	x				x	x						
San Bernardino	x	x	x		x		x			x	x		x	x	x				x	x	x		x	x	x	x
San Diego	x		x			x	x	x		x	x		x	x	x		x		x	x	x		x			x
San Joaquin	x	x			x		x			x	x			x	x		x		x	x	x	x	x			
San Luis Obispo	x		x	x			x	x		x	x	x	x	x	x		x		x	x	x					
Santa Barbara	x		x	x	x		x	x		x	x		x	x	x		x		x	x	x					
Santa Clara[a]	x	x		x	x		x	x		x	x			x	x				x	x	x					
Santa Cruz	x	x		x	x		x	x		x	x			x	x				x	x	x					
Shasta[a]	x	x			x		x	x						x	x	x	x	x	x	x	x	x	x			
Solano[a]	x	x			x		x	x		x	x			x	x				x	x	x					
Stanislaus	x	x			x		x			x	x			x	x		x		x	x	x	x	x			
Sutter[a]	x	x			x		x			x	x			x	x				x	x			x			
Tehama[a]	x	x			x		x	x		x	x			x	x	x	x		x	x	x		x			
Tulare	x	x			x		x	x			x			x	x		x		x	x	x		x			
Tuolumne	x	x			x		x	x						x	x		x	x	x	x						
Ventura	x		x				x	x		x	x		x	x	x		x		x	x	x					
Yolo[a]	x	x			x			x		x	x			x	x		x		x	x	x		x			

[a]These counties are located in both the Secondary and Extended study areas.
[b]These two counties are located in all three study areas (Primary, Secondary, and Extended).
Source: MVCAC, 2003.

Liver flukes and conenose bugs exist throughout the Extended Study Area. Liver flukes infect mammals (both humans and animals) when the human/animal drinks contaminated water or ingests raw watercress or other aquatic plants that are contaminated with immature parasite larvae. The immature larval flukes migrate through the intestinal wall, the abdominal cavity, and the liver tissue into the bile ducts where they develop into mature adult flukes. The adult flukes lay eggs, which are passed out in the infected human/animal feces. The eggs hatch in fresh water and infect a snail host by penetrating its shell. The eggs develop within the snail and attach to aquatic plants, and the cycle continues (CDC, 2010).

Conenose bugs are also known as kissing bugs. They are a bloodsucking parasite of a wide variety of domestic and wild animals and humans. In California, these bugs are most prevalent in the foothill areas surrounding the Central Valley and in the foothills and desert areas of southern California. The only important species in California is the western bloodsucking conenose (*Triatoma protracta*). It lives in the nests of wood rats, but also flies into homes. The bites are not painful, but can produce an allergic reaction. Typically, bites occur at night while victims are sleeping (Greenberg and Klotz, 2002).

Rodents and Flies

Other vectors transmitting disease in the Extended Study Area include rodents and flies. Hantavirus Cardiopulmonary Syndrome Disease (HCSD) is a potentially fatal disease caused by the Sin Nombre virus, which can be carried by wild rodents. In California, only wild deer mice (*Peromyscus* spp.) carry the Sin Nombre virus. Because these deer mice are present throughout California, the California Department of Public Health routinely tests rodents for the presence of the virus. During 2011, although the virus was present in eight percent of the rodents tested (primarily in San Diego County), no cases of HCSD were reported (CDPH, 2012).

Plague is a bacterial disease caused by the bacterium *Yersinia pestis* and is transmitted by wild rodents. Humans can contract the disease if bitten by the fleas of an infected rodent, or through direct contact with a sick rodent. In California, the most common carriers of plague are ground squirrels, chipmunks, woodrats, and mice. The California Department of Public Health routinely tests rodents for the presence of antibodies to *Yersinia pestis*. During 2012, seven ground squirrels and 28 chipmunks tested positive for the antibodies. No human cases of plague were reported (CDPH, 2013).

Nuisance flies are insects that are annoying or can spread disease. All nuisance flies are of the Order Diptera and are found throughout California. Common nuisance flies include midges, house, deer, and horse flies. Flies become a problem when they congregate on dead animals, feces, or garbage, and then transfer pathogens to humans and animals (CDPH, 2010).

Rattlesnakes

The rattlesnake is California's only native venomous snake. California rattlesnake species include the western rattlesnake (*Crotalus oreganus*) found throughout California (with the exception of the desert), and the following species found in southern California: western diamondback (*Crotalus atrox*), sidewinder (*Crotalus cerastes*), speckled rattlesnake (*Crotalus mitchellii*), red diamond rattlesnake (*Crotalus ruber*), Mojave rattlesnake (*Crotalus scutulatus*), and the Panamint rattlesnake (*Crotalus stephensi*) (CDFG, 2012). In California, rattlesnakes are found from sea level to the inland prairies and desert areas and to the mountains at elevations of more than 10,000 feet (CDFW, 2013).

Most rattlesnakes forage for prey in or near brushy or tall grass areas, rock outcrops, rodent burrows, around and under surface objects, and sometimes in the open. Adults eat live prey, primarily rodents; the young take mostly lizards and young rodents (Salmon, et al., 2004). Rattlesnakes are generally not aggressive, but will strike when threatened or deliberately provoked. Most snake bites occur on the hands, ankles, or feet when a rattlesnake is handled or accidentally touched by someone walking or climbing. Rattlesnakes cause serious injury to humans on rare occasions. In the United States, out of the approximately 800 rattlesnake bites reported annually, one to two are fatal. Most bites occur between the months of April and October (CDFW, 2013).

Poison Oak

Poison oak (Toxicodendron diversilobum), which can take the form of a shrub or climbing vine, is widespread in California and grows in a variety habitats. Direct contact with the oil from poison oak leaves or stems can cause an allergic skin reaction (dermatitis) in humans that typically lasts for 10 days. An allergic reaction can also occur through indirect contact with the plant, such as by touching contaminated clothing or pets. Poison oak is considered to be the most hazardous plant in California due to the number of working hours lost as a result of the dermatitis it causes (DiTomaso and Lanini, 2009).

Giardia and Swimmer's Itch

The vectors that transmit Giardia and Swimmer's Itch occur throughout the Extended Study Area. Giardia (also known as beaver fever, backpacker disease, and Giardiasis) is caused by the microscopic parasite *Giardia lamblia* and is considered to be one of the most common sources of waterborne illness. The parasite lives in the intestines of warm-blooded animals and is transmitted from host to host when it is ingested. The parasite attaches itself to the host's intestine and causes gastrointestinal symptoms that can last from two weeks to two months. *Giardia* is typically passed to humans when they drink surface water that is contaminated by grazing cattle or game animals (Hairston, No Date).

Swimmer's itch (also called cercarial dermatitis) is a rash that is caused by an allergic reaction to certain parasites (cercaria[3]) that infect some birds and mammals. The parasites are released from infected snails into fresh and salt water (including lakes, ponds, and oceans). If the parasite comes into contact with a swimmer, it burrows into the skin, causing an allergic reaction and rash. Swimmer's itch occurs more frequently during the summer months (CDC, 2012).

Appendix 28B describes vectors found within California and nuisance problems associated with them.

28.2.2 Secondary Study Area

28.2.2.1 Hazardous Materials

The Secondary Study Area also covers a large and diverse geographical area, and the causes of concern are similar to that described for the Extended Study Area. In addition, the hazardous material contamination issues noted in the Extended Study Area also relate to the Secondary Study Area and are discussed in detail below.

Dredging, Mining, and Mercury

Mercury contamination from the inorganic mercury used in historic gold mines represents a potential risk to human health and the environment. Inorganic mercury is converted by microorganisms in soil and sediments (in air or water) to organic methylmercury, which is a neurotoxin that attacks the central nervous system and causes numerous developmental and other problems. Methylmercury then bioaccumulates[4] in

[3] The free-swimming parasitic larva of a trematode worm.

[4] The gradual build-up of toxins in an organism at levels higher than those that occur in the surrounding environment.

the food chain. High levels of methylmercury contamination in fish, amphibians, and invertebrates downstream of the hydraulic mines are a consequence of historic mercury use (USGS, 2000).

Mercury was a key element in the California Gold Rush because of its role in separating precious metals, such as gold and silver, from contaminants. The extensive panning activity along California's streams soon exhausted the readily available gold and led to the development of hydraulic mining. Hard rock mining and dredging was also initiated during this period. A significant step in all of these procedures involved the use of large quantities of mercury (UCD, 2010).

To enhance gold recovery from hydraulic mining, hundreds of pounds of liquid mercury were added to riffles and troughs in a typical sluice. The high density of mercury allowed gold and gold-mercury amalgam to sink while sand and gravel passed over the mercury and through the sluice. Large volumes of turbulent water flowing through the sluice caused many of the finer gold and mercury particles to wash through and out of the sluice before they could settle in the mercury-laden riffles. A modification known as an undercurrent reduced this loss. The finer grained particles were diverted to the undercurrent, where gold was amalgamated on mercury-lined copper plates. Most of the mercury remained on the copper plates; however, some was lost to the flowing slurry and was transported to downstream environments (USGS, 2000).

Loss of mercury in the mining process resulted in highly contaminated sediments at mine sites. Elevated mercury concentrations in present-day mine waters and sediments indicate that hundreds to thousands of pounds of mercury remain at each of the many sites affected by hydraulic mining (USGS, 2000).

Hydraulic mines were operated on a large scale from the 1850s to the 1880s in the northern Sierra Nevada region. In 1884, the Sawyer Decision prohibited discharge of mining debris in the Sierra Nevada region, but not in the Klamath-Trinity Mountains where hydraulic mining continued until the 1950s. Underground mining of placer deposits and of hard rock gold-quartz vein deposits produced most of California's gold from the mid-1880s to the early 1900s. Dredging of gold-bearing sediments in the Sierra Nevada foothills has been an important source of gold since the early 1900s (USGS, 2000).

The American, Bear, Yuba, and Feather River watersheds each have been affected by hydraulic mining. In the northwestern Sierra Nevada, the highest average levels of mercury bioaccumulation occur in the Bear River and South Yuba River watersheds (USGS, 2000).

Acid mine drainage is also an issue within the Secondary Study Area. In particular, the Iron Mountain Mine Superfund site in Shasta County continues to cause environmental concern. The Iron Mountain Mine operated within the Spring Creek watershed from the 1860s to the 1960s. The mine extracted iron, silver, gold, copper, zinc, and pyrite. This historic mining activity at the mine fractured the mountain, exposing minerals in the mountain to surface water, rain water, and oxygen. When pyrite is exposed to moisture and oxygen, sulfuric acid forms. The sulfuric acid flows through the mountain and leaches out copper, cadmium, zinc, and other heavy metals. Much of this acidic mine drainage ultimately is channeled into the Spring Creek Reservoir by creeks surrounding the mine. Reclamation periodically releases the stored acid mine drainage into Keswick Reservoir. Planned releases are timed to coincide with the presence of diluting releases of water from Shasta Dam. On occasion, uncontrolled spills and excessive waste releases have occurred when Spring Creek Reservoir reached capacity. Without sufficient dilution, this results in the release of harmful quantities of heavy metals into the Sacramento River. Since 1940, high levels of contamination in the Sacramento River have caused numerous fish kills. The low pH level and the heavy metal contamination from the mine have caused the virtual elimination of aquatic life in sections of Slickrock Creek, Boulder Creek, and Spring Creek. The continuous release of metals from the mine has contributed to a steady decline in the fisheries population in the Sacramento River (USEPA, 2011).

Quarrying

Quarrying can substantially modify the routing of groundwater recharge, causing water quality degradation. Commonly, the first impact of quarrying is to remove the overlying vegetation and soil. In temperate areas, removing vegetation and soil reduces evapotranspiration and increases the effective rainfall. Unless measures are taken to control runoff and sedimentation, deterioration of groundwater is likely (USGS, 2001).

Engineering activities associated with quarrying can directly change the course of surface water. Sinkholes created by quarrying can intercept surface water flow. Groundwater pumping from quarries changes gaining streams (volume is contributed to by groundwater) to losing streams (volume decreases as it flows downstream), and can drain other nearby surface water features such as ponds and wetlands. Similarly, blasting can modify groundwater flow, which ultimately can modify surface water flow. Discharging quarry water into nearby streams can increase flood recurrence intervals (USGS, 2001).

The risk of groundwater pollution may increase if the direction of groundwater flow is modified. New source areas of recharge may be introduced, and those sources may contain contaminated water. This situation can arise because of groundwater pumping, or can occur if old choked passages are flushed and become operational again (USGS, 2001).

Railroads

Although rail transport is generally considered a safe form of shipment, there are various possibilities for accidents and breakdowns to occur. Trains are heavy, unable to deviate from the track, and require a great distance to stop. Accidents include derailments, head-on collisions with other trains, collisions with road vehicles, and hazardous material spills into waterways. Any train derailment that results in a release or threatened release of contaminants is considered a major hazardous material spill (NTSB, 2010).

Some historic railroad operations involved the use of chemicals that may have resulted in contamination. The most commonly reported contamination along rail lines includes metals, pesticides[5] (such as lead arsenate), and constituents of oil or fuel (petroleum products). These chemicals have been associated with normal railroad operations and are likely to be found anywhere along the line. An example is arsenic (up to ten times natural background levels) may be present in the soil along a right-of-way from old railroad ties dipped in an arsenic solution, arsenic weed-control sprays, and arsenic-laced slag used as railroad bed fill. Lubricating oil and diesel that dripped from the trains are likely sources of the petroleum product found along the lines. Other sources of contaminants associated with historic railroad operation may include coal ash from engines, creosote from ties, and polynuclear aromatic hydrocarbons (“PAHs”) from the diesel exhaust (CMDEP, 2011).

Agriculture

Agriculture is a major land use in the Secondary Study Area, and a wide variety of crops are grown year-round. Long-term use of agricultural chemicals, including pesticides, herbicides, fertilizers, and crop-specific additives can lead to toxic buildup of residues in the soil (DWR, 2010).

[5] The application of pesticides consistent with their labeling is excluded from the definition of a “release” under M.G.L. Chapter 21E.

Water Wells and Septic Systems

Communities in rural areas may rely on septic systems and water wells. Failure of septic systems can result in pollution of the soil and groundwater (Marin County, 2005). Abandoned, unsecured, or damaged underground water wells or piping systems can serve as a potential conduit for soil and groundwater contamination (DWR, 2010).

28.2.2.2 Wildland Fires

Similar to that described for the Extended Study Area, wildland fires within the Secondary Study Area also pose a hazard to rural and urban development, infrastructure, and natural resources. Based on a review of CAL FIRE's statewide map of fire hazard severity zones, the lands surrounding the waterbodies included within the Secondary Study Area are designated with a fire hazard severity ranging from moderate to very high. The lands surrounding Trinity Lake, Trinity River, Klamath River, Whiskeytown Lake, Lewiston Lake, Spring Creek, Clear Creek, Shasta Lake, and Keswick Reservoir are designated as very high risk for wildland fire (CAL FIRE, 2007a).

The lands surrounding the Sacramento River downstream of Shasta Dam, the Sutter Bypass, and the Yolo Bypass are largely unzoned for fire hazard, with intermittent areas designated as moderate risk for wildland fire. The lands surrounding Lake Oroville are designated as very high risk, and the lands surrounding the Feather River downstream of Oroville Dam are designated as high risk near the dam, and as moderate risk for the rest of the river. The lands surrounding Folsom Lake are designated as moderate risk for wildland fire, and the American River downstream of Folsom Dam is largely unzoned for fire hazard, with intermittent areas designated as moderate risk for wildland fire (CAL FIRE, 2007a).

The lands surrounding the Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay are mostly unzoned for fire hazard, with intermittent areas designated as moderate or high risk for wildland fire (CAL FIRE, 2007a).

All of these waterbodies are surrounded intermittently by identified communities at risk from wildlfire. Numerous identified communities at risk from wildfire are located in the vicinity of Trinity Lake, Shasta Lake, and Lake Oroville (CAL FIRE, 2001).

28.2.2.3 Mosquitoes, Other Vectors, and Nuisance Problems

Because much of the Secondary Study Area is included within the Extended Study Area, the mosquito, other vectors, and nuisance problem concerns for the Extended Study Area are also applicable to the Secondary Study Area. The mosquito species that are found within the counties that comprise the Secondary Study Area are listed in Table 28-2.

Table 28-2
Distribution of Mosquitoes in Counties that Comprise the Secondary Study Area

	Mosquito Species																													
	Aedes		Ochlerotatus										Anopheles					Culex									Culiseta			Others	
County	hemiteleus	vexans	bicristatus	dorsalis	fitchii	hexodontus	Increpitus complex	melanimon	nigromaculis	sierrensis	squamiger	sticticus	franciscanus	freeborni	hermsi	occidentalis	punctipennis	apicalis	boharti	erythrothorax	Pipiens/quinque.	reevesi	stigmatosoma	tarsalis	territans	thriambus	incidens	inornata	particeps	Cq. perturbans	Cr. signifera
Del Norte	x			x			x			x			x	x		x	x	x	x	x	x		x	x	x		x	x	x	x	
Humboldt		x	x	x	x		x			x			x	x		x	x	x	x	x	x		x	x	x		x	x	x	x	
Marin			x	x			x		x	x	x		x	x		x	x	x	x	x	x	x	x	x		x	x	x	x		
San Francisco										x						x					x		x				x	x	x		
San Mateo			x	x			x			x	x		x	x	x	x	x	x	x	x	x	x	x	x			x	x	x		x
Sonoma			x	x			x	x	x	x	x		x	x		x	x	x	x	x	x		x	x		x	x	x	x		x
Trinity			x		x	x	x		x	x			x	x			x	x	x				x	x	x		x	x	x	x	
Yuba		x					x	x	x	x		x	x	x			x	x	x	x	x		x	x	x	x	x	x	x	x	x

Note:
See Table 28-1 for 14 additional counties that are located within the Secondary Study Area.
Source: MVCAC, 2003.

28.2.3 Primary Study Area

28.2.3.1 Hazardous Materials

Hazardous material contamination issues noted in the Extended and Secondary study areas may also apply to the Primary Study Area, depending upon proximity. There are no designated Superfund or Brownfields sites located within the Primary Study Area. Hazardous material contamination issues specific to the Primary Study area are discussed below.

Environmental Contamination Assessment Methodology

Assessing environmental contamination within a property can be accomplished through the Phase I Environmental Site Assessment process. Phase I Environmental Site Assessments are performed in conformance with the scope and limitations of the American Society for Testing and Materials (ASTM) E1527-05 standard practice and the requirements set forth in Title 40, Part 312 of the Code of Federal Regulations (CFR).

The purpose of a Phase I Environmental Site Assessment, as specified by ASTM E1527-05 standard practice is to identify “recognized environmental conditions”. This standard defines the term “recognized environmental conditions” as:

> “…the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws…The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate government agencies” (ASTM, 2005).

The Phase I Environmental Site Assessment process includes information obtained from the following activities: a site reconnaissance, historical review of land use, review of land title records, consultation with local environmental health officials, contact with the land owners, review of available maps and records, and review of federal and State environmental databases (ASTM, 2005).

A review of federal and State databases can be accomplished through an environmental database search. BBL Environmental Information was contracted to conduct a database search for the Primary Study Area. The resulting report identified reported sources of hazardous materials contamination existing within the footprints of Project features.

Only the database portion of the Phase I process was conducted for this DEIR/EIS. A full Phase I Environmental Site Assessment would be conducted prior to property acquisition and would be presumed to be valid for 180 days. After that period, it should not be used without a current investigation of conditions likely to affect recognized environmental conditions on the property, which may have changed materially since the assessment was first conducted (ASTM, 2005).

Database Search Methodology

A record search determines if any reported sources of hazardous materials contamination exists within an approximate minimum search distance (ASTM, 2005). An extensive list of federal, State, and local regulatory agencies' published databases was reviewed; a complete listing of the records is included in Appendix 28C.

A standard ASTM record search uses a one-mile radial search from the center of a property, but because of the large size and irregular shape of the Primary Study Area, modified search patterns were performed.

To ensure complete coverage of the locations of all of the proposed Primary Study Area Project facilities, the record search was divided into two separate reports: the Sites Reservoir Environmental Record Search Report and the Funks Reservoir/Delevan Pipeline Environmental Record Search Report[6] (Appendix 28C). All Primary Study Area Project facilities were included in the database record searches, with the exception of the GCID Canal Facilities Modifications.

Database Search Results

The sites identified in the record search reports as having known environmental concerns are discussed below and identified by their respective Environmental Record Search Report map ID number. All other sites with operating permits are included only in the full record search reports (Appendix 28C).

Sites Reservoir and Related Project Facilities

Sixteen records were identified in the Sites Reservoir Report (Appendix 28C), representing 15 separate sites. Ten sites have operating permits. The remaining five sites have environmental concerns and are mentioned below.

Four sites were identified from the Mineral Industry Location System (MILS), a database maintained by the U.S. Bureau of Mines. The MILS covers over 200,000 mineral occurrences, deposits, mines, and processing plants in the U.S. The information is used to support government agencies that have land use planning responsibilities. These agencies look to the Bureau of Mines both for mineral resource assessments and for help identifying and remediating inactive and abandoned mine hazards.

- Map ID 2: An unnamed location and operation, but identified chromium as a commodity. The closest Project facility is the proposed South Bridge west approach road on the west side of the proposed Sites Reservoir. The site is located outside of the proposed Project Buffer.
- Map ID 4: Sandstone Company Quarry, a surface operation producing sand and gravel. The closest Project facility is the proposed Com Road on the eastern border of the proposed Sites Reservoir. The site is located outside of the road right-of-way.
- Map ID 6: McGilvray Quarry, a surface operation producing sand and gravel that is closed. The quarry is located on the eastern border of the proposed Sites Reservoir, between Maxwell Sites Road, the proposed Sulphur Gap Road, and the proposed Com Road. The site is located outside of the road right-of-way.
- Map ID 7: Talbot, an underground operation producing stone. The closest Project facility is the proposed Saddle Dam 6 on the northern border of the proposed Sites Reservoir. This site is located within the proposed Project Buffer.

[6] Some overlap may occur between the two reports.

One site was identified from the Emergency Response Notification System (ERNS), a national computer database used to store information on unauthorized releases of oil and hazardous substances. There were two incidences where unauthorized releases of oil and hazardous substances occurred at this site.

- Map ID 8: Delevan Compressor Station, located at 5001 Delevan Road in Maxwell, California. On June 24, 2007, 250 gallons of turbine oil were released from a gas turbine onto a concrete structure because of equipment failure. On May 2, 2005, 220 gallons of turbine oil were released into a secondary containment area because of a broken hydraulic pipe. Cleanup was completed. The western end of the proposed Delevan Pipeline and the Terminal Regulating Reservoir (TRR) facilities are located in proximity to this identified site.

Funks Reservoir and Related Project Facilities

Fifty records were identified in the Funks Reservoir and Delevan Pipeline Report (Appendix 28C), representing 46 separate sites. Thirty-six sites are identified as having operating permits. The remaining 10 sites have known environmental concerns, but only three are located within the search boundaries. These three sites are discussed below and identified by their Environmental Record Search Report map ID number.

The following sites were identified from MILS and ERNS, respectively:

- Map ID 2: Compton Landing, an unnamed operation in Colusa, California, lists its commodity as natural gas. The closest Project facilities are the proposed Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility at the eastern end of the proposed Delevan Pipeline.
- Map ID 21: An unnamed site at McDermott and Delevan roads in Delevan, California. A spill of 20 percent aqua ammonia (unknown quantity) occurred into an irrigation canal from an overturned truck. The spill date is unknown. The closest Project facilities are the western portion of the proposed Delevan Pipeline and the TRR facilities.

The site mentioned below was listed in the Toxic Releases database. The California RWQCBs or local Department of Health Services tracks toxic releases to the environment. These lists are known as Unauthorized Releases, Spills, Leaks, Investigations, and Cleanups (SLIC), Non-Tank Releases, Toxics List or similar, depending on the local agency.

- Map ID 16: JR Simplot Soil Builders, located on old Highway 99 at Lenahan Road in Maxwell, California. No additional information regarding type of incident was available. Status is inactive. The nearest Project facility is the proposed Delevan Pipeline.

Numerous permitted Underground Storage Tanks (USTs) were identified in the two record search reports. Three USTs were found within the footprint of the proposed Sites Reservoir. Not all UST locations are known. In addition, there is the possibility of unidentified USTs because of the remote location and history of agricultural activity in the area.

The town of Sites is located within the proposed footprint of Sites Reservoir. Existing residences, outbuildings, and roads are associated with the town. No site reconnaissance was conducted for this analysis to assess the potential hazardous material concerns related to these structures; therefore, further investigation is recommended prior to property acquisition. Hazardous material concerns within the Primary Study Area that were not identified through the BBL record search include septic systems, water wells, a railroad, a quarry, and agricultural activity. The potential hazards associated with these issues are discussed in Section 28.2.2.1.

Hazardous material concerns within the Primary Study Area not documented in the BBL reports include historic salt mining and oil wells. Salt mining occurred in the Antelope Valley beginning in the 1860s and continued until 1900. In addition, oil was discovered in the spring of 1865 in Colusa County. Several test wells were drilled in the area, but did not prove profitable.

Arsenic is also a hazardous material concern not identified in the BBL reports. High arsenic levels have been found in areas located within the Primary Study Area. Salt Lake, which is located within the northeastern portion of the Sites Reservoir footprint (inundation area), has high arsenic levels. Funks Creek and Stone Corral Creek have levels of arsenic that exceed the California Public Health Goal, but meet the USEPA arsenic rule. Water samples from the T-C Canal and GCID Canal intakes, the Colusa Basin Drain, and from the Sacramento River near Moulton Weir exceed the human toxicity criteria for arsenic.

28.2.3.2 Wildland Fires

Wildland fires within the Primary Study Area pose a hazard to rural development, infrastructure, and natural resources. The lands surrounding the proposed TRR Pipeline, TRR and associated facilities, Delevan Pipeline Electrical Switchyard, Delevan Pipeline, and Delevan Pipeline Intake/Discharge facilities, which are intensively managed agricultural lands, are unzoned for fire hazard. The lands surrounding the locations of the proposed GCID Canal Facilities Modifications are also unzoned for fire hazard. The remaining proposed Project facilities within the Primary Study Area are surrounded by lands designated as moderate risk for wildland fire (CAL FIRE, 2007b).

The identified community at risk for wildfire that is located closest to the defined Primary Study Area is the town of Lodoga (CAL FIRE, 2001).

28.2.3.3 Mosquitoes and Other Vectors

Mosquitoes

Mosquito species found in Glenn and Colusa counties are listed in Table 28-3.

Table 28-3
Distribution of Mosquitoes in Counties that Comprise the Primary Study Area

	Mosquito Species																		
	Aedes	Ochlerotatus						Anopheles			Culex							Culiseta	
County	vexans	dorsalis	Increpitus	melanimon	nigromaculis	sierrensis	sticticus	franciscanus	freeborni	punctipennis	apicalis	boharti	erythrothorax	pipiens/quinque	stigmatosoma	tarsalis	thriambus	incidens	inornata
Colusa	x	x	x	x	x	x	x	x	x	x			x	x	x	x		x	x
Glenn	x			x	x	x		x	x		x	x	x	x	x	x	x	x	x

Source: MVCAC, 2003.

Appendix 28B describes these mosquito species, their season of activity, preferred host, and habitat, as well as several mosquito-borne diseases.

Other Vectors and Nuisance Problems

Stinging Insects, Ticks, Liver Flukes, Conenose Bugs, Rodents, Rattlesnakes, Flies, Poison Oak, Giardia, and Swimmer's Itch

The western yellowjacket and the German yellowjacket, as well as the European honeybee, inhabit Glenn and Colusa counties. Stinging ants are also a concern in Glenn and Colusa counties, particularly the red imported fire ant.

The Pacific Coast tick, the American dog tick, and the western black-legged tick inhabit Glenn and Colusa counties (Cavier Jr., 2004; Kiely, 2004). Ticks were incidentally observed during Project field surveys.

As indicated previously, in California, only wild deer mice carry the Sin Nombre virus. Deer mice are present in Glenn and Colusa counties, but of the rodents tested in the fall and winter of 2011, there were no cases of the Sin Nombre virus antibodies present (CDPH, 2012). Deer mice were captured during Project field surveys in annual grassland, oak woodland, riparian, and chaparral habitat.

The California ground squirrel, which as indicated previously can carry plague, was observed during Project field surveys throughout the Primary Study Area in annual grassland and oak woodland habitat.

Western rattlesnakes were also frequently observed during Project field surveys in annual grassland and oak woodland habitats.

All nuisance flies are found throughout California. The olive fruit fly is common in areas where olive trees are abundant, such as in the orchards in Glenn and Colusa counties. Although these flies are not known to transmit disease, they can damage the olive fruit and make it unusable for commercial olive oil and olive production (CDPH, 2010).

Poison oak was observed in the Primary Study area during Project field surveys, typically associated with oak woodland and riparian habitat.

Giardia occurs within Glenn and Colusa counties. During Project field surveys, a beaver dam was observed along Funks Creek immediately downstream of the existing Funks Reservoir. Liver flukes, conenose bugs, and the parasites that cause Swimmer's Itch also occur within Glenn and Colusa counties. Appendix 28B describes these vectors and the nuisance problems associated with them.

28.3 Environmental Impacts/Environmental Consequences

28.3.1 Regulatory Setting

Hazardous materials and other environmental hazards are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this DEIR/EIS.

28.3.1.1 Federal Plans, Policies, and Regulations

- Clean Water Act
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as Amended
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996
- Safe Drinking Water Act (Underground Injection Control) of 1974, as Amended
- Hazardous Materials Transportation Act of 1975
- Resource Conservation and Recovery Act of 1976, as Amended

- Toxic Substances Control Act of 1976

28.3.1.2 State Plans, Policies, and Regulations

- California Safe Drinking Water Act
- California Hazardous Substances Account Act of 1999
- California Land Reuse and Revitalization Act of 2004
- California Underground Storage Tank Program
- Aboveground Petroleum Storage Act of 2007
- Toxic Injection Well Control Act of 1985
- Safe Drinking Water and Toxics Enforcement Act
- California Hazardous Waste Control Act
- California Integrated Waste Management Board Solid Waste Program
- Hazardous Materials Release Response Plans and Inventory
- State Board Resolution Number 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges
- Mosquito Abatement Act of 1915
- California Health and Safety Code: Division 3, Chapter 1, Article 4, Sections 2040, 2041, 2060-2065 (Mosquito and Vector Control District Law)
- California Government Code: Title 3, Division 2, Part 2, Chapter 8, Article 3, Section 25842.5
- California Mosquito-Borne Virus Surveillance and Response Plan

28.3.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

28.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for hazards and hazardous materials:

Would the Project:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?

- Be located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, and as a result, would it create a significant hazard to the public or the environment?
- Result in a safety hazard for people residing or working in the Project area (for a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport)?
- Result in a safety hazard for people residing or working in the Project area (for a project within the vicinity of a private airstrip)?
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Create a significant public or environmental hazard from the routine transport, use, or disposal of hazardous materials.
- Create a significant public or environment hazard from the release of hazardous materials into the environment.
- Effects from hazardous emissions or hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school.
- Create a significant hazard to the public or the environment from the Project being located on a listed hazardous materials site.
- Effects on adopted emergency response plan or emergency evacuation plan implementation.
- Expose people or structures to a significant risk of loss, injury, or death from wildland fires.
- Create a safety hazard for people residing or working in the Project area (if located within an airport land use plan, or within two miles of a public airport or public use airport if no plan has been adopted).
- Create a safety hazard for people residing or working in the Project area (if located within the vicinity of a private airstrip).

In addition to addressing the impacts listed above, this chapter also evaluates the public health hazards from mosquitoes, other vectors, and nuisance problems. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Expose people to an increased risk of mosquito-borne or other vector-borne illnesses, or increased exposure to nuisance problems.

28.3.3 Impact Assessment Assumptions and Methodology

28.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to public health and environmental hazards:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational activities would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake or Discharge Facilities would be required.

28.3.3.2 Methodology

<u>Hazardous Materials and Wildland Fires</u>

Identification of existing hazardous material contamination at Project facility locations was conducted by reviewing a list of federal, State, and local regulatory agencies' published databases and comparing that information to the Project's footprint.

A review of Fire Hazard Severity Zones (CAL FIRE, 2001, 2007a, and 2007b) was conducted to determine wildland fire safety hazards.

A review of County Zoning Maps (Glenn County, 2006 and Colusa County, 2011) was conducted to determine airport zones within the Primary Study Area.

Mosquitoes, Other Vectors, and Nuisance Problems

The evaluation of potential impacts to the public's health from the possible exposure to mosquitoes or other vectors and their associated ailments, as well as to nuisance problems due to implementation of the Project, was a multi-step process and included the following:

- Determining the types of vector habitats that would be created from the Project facilities
- Determining at which Project facilities the public would have access to those vector habitats, or to habitats that support nuisance species
- Assessing whether the public's exposure to such vector or nuisance species habitats would result in a significant impact

28.3.4 Topics Eliminated from Further Analytical Consideration

Within the Extended and Secondary study areas, no Project-related activities would expose people residing or working in the vicinity of the Project facilities to an aircraft safety hazard because of the distance of existing public airports or private airstrips to the Project facilities. Therefore, potential impacts related to aircraft safety hazards (**Impact Pub Health-7** and **Impact Pub Health-8**) are not discussed further for these two study areas.

Within the Primary Study Area, a public airport is located near the proposed modifications to the GCID Canal Facilities. Potential impacts related to aircraft safety hazards (**Impact Pub Health-7**) are discussed for that Project facility only. There are no private airstrips in the vicinity of the Primary Study Area facilities. Therefore, potential impacts related to private airstrip safety hazards (**Impact Pub Health-8**) are not discussed further for this study area.

28.3.5 Impacts Associated with the No Project/No Action Alternative

28.3.5.1 Hazardous Materials and Wildland Fires

Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts due to hazardous materials has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** related to the transport, use, or disposal of hazardous materials, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to increase the potential for hazardous materials spills/accidents as urban growth moves out into the undeveloped vegetated areas of the state. These impacts that could occur as a result of the increased population would be managed at the local level (e.g., cities and counties) in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions

In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area and therefore **would not have a substantial adverse effect** related to the transport, use, or disposal of hazardous materials, when compared to Existing Conditions.

Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to the release of hazardous materials into the environment.

Impact Pub Health-3: Effects from Hazardous Emissions or Hazardous Materials, Substances, or Wastes within 0.25 Mile of an Existing or Proposed School

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to hazardous emissions, materials, substances, or wastes in the vicinity of a school.

Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to Projects being located on a listed hazardous materials site.

Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to effects on emergency response or evacuation plan implementation.

Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to wildland fire risk.

28.3.5.2 Mosquitoes, Other Vectors, and Nuisance Problems

Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts from mosquitoes, other vectors, and nuisance problems has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** from mosquito or vector populations, habitat, and the spread of mosquito- or vector-borne illnesses, or an exposure to nuisance problems, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population and its associated additional residential, commercial, and industrial development could be expected to cause more standing water and other conditions considered favorable to mosquitoes and other vectors, and could create habitat that supports nuisance species.

There are currently many areas within the Extended, Secondary, and Primary study areas where favorable conditions exist for mosquitoes and other vectors. The 1915 Mosquito Abatement Act allowed for communities to form Mosquito and Vector Control Districts, and the subsequent passage of the Mosquito and Vector Control District Law provided the authority to county agencies to implement surveillance and abatement programs to control mosquito and other vector populations. Thus, many counties within the three study areas have extensive mosquito and vector control programs in place. If the No Project/No Action Alternative is implemented, **there would not be a substantial adverse effect** from mosquito or vector populations, habitat, the spread of mosquito- or vector-borne illnesses, or an exposure to nuisance problems when compared to Existing Conditions, because these mosquito and vector control programs are expected to remain in place.

It is possible, however, that private landowners within the three study areas could ignore existing control practices and create conditions (such as stagnant stock ponds) that may cause an increase in mosquito or other vector populations. This increase, in turn, may create new demands on existing mosquito and vector control program resources. In such cases, the local county agencies have the authority to leverage fines on the non-compliant landowners to recover costs of abatement programs on a case-by-case basis (CDPH, 2005). Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

In addition, projects included in the No Project/No Action Alternative are not located within the Primary Study Area and therefore **would not have a substantial adverse effect** to/from mosquitoes or vector populations, habitat, and the spread of mosquito- or vector-borne illnesses, or from increased exposure to nuisance problems, when compared to Existing Conditions.

28.3.6 Impacts Associated with Alternative A

28.3.6.1 Hazardous Materials and Wildland Fires

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials

Because there would be no direct Project-related construction or maintenance occurring in the Extended Study Area, there would be no direct or indirect impacts on public health related to hazardous materials in the Extended Study Area. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Although there are no direct Project-related construction or maintenance activities that would occur in the Extended Study Area, there would be operational activities. Project operations would result in increased water fluctuations at San Luis Reservoir, increased water supply reliability to agriculture, municipal, and industrial users, and an alternate water supply for wildlife refuge use. The increased water level fluctuations at San Luis Reservoir would be within the historic range of the reservoir's fluctuations, and the wildlife refuges would receive water from the Project only as an alternate source. These changes would not be associated with or have an effect on hazardous waste transport, use, or disposal. Similarly, the expected small increase in municipal and industrial water supply reliability would not be expected to affect hazardous waste transport, use, or disposal. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

It is possible that increased agricultural water supply reliability, associated with proposed Project operations, would have the potential to change cropping patterns, such as from annual crops to orchards. This change in cropping patterns could result in differing amounts and types of pesticides used. However, modeling results show that the potential effects of increased water supply reliability would be small, and would not occur on a large enough scale that would be expected to have a substantial effect on pesticide use patterns for agriculture. These Project operations are not expected to create a hazard, resulting in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to the release of hazardous materials into the environment.

Impact Pub Health-3: Effects from Hazardous Emissions or Hazardous Materials, Substances, or Wastes within 0.25 Mile of an Existing or Proposed School during Project Construction, Operation, or Maintenance

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to hazardous emissions, materials, substances, or wastes in the vicinity of a school.

Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site

No Project-related construction would occur in the Extended Study Area. Consequently, no listed hazardous materials sites would be affected. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation

There would be no direct Project-related construction or maintenance occurring in the Extended Study Area. Operation at San Luis Reservoir would be modified to accommodate the proposed Project operation, which would result in more frequent and larger surface water elevation fluctuations at the reservoir than currently occurs there. The ability of emergency responders to respond to future emergencies or evacuations is not expected to change from existing conditions as a result of those changes in operations. Increased water supply reliability to agricultural, municipal, and industrial users, as well as an alternate supply of wildlife refuge water, would have no effect on emergency response or evacuation plans. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires

Operations at San Luis Reservoir would be modified with implementation of Alternative A, but would not be expected to change any existing wildland fire risk to people and structures at the reservoir. Similarly, increased water supply reliability to agricultural, municipal, and industrial users, as well as an alternate supply of wildlife refuge water, would not change existing wildland fire risk. Operational changes within the Extended Study Area would, therefore, result in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant. The installation of the pump and its associated operation and maintenance, as well as the maintenance activities at the canal intakes, would require the use of limited quantities of hazardous materials, such as fuels, oils, grease, and lubricants. Maintenance and repair of the equipment would be completed at the facility site, or the equipment would be transported to nearby facilities.

The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the removal of sediment from the existing canal intakes. Sediment removal has the potential to accidentally release hazardous materials.

The use, storage, handling, or disposal of hazardous materials could result in hazardous releases from equipment or through other means during construction, operation, or maintenance, thereby exposing workers to hazardous materials. There could also be accidental releases of hazardous materials that would contaminate soil or degrade water quality. The potential release of hazardous materials during construction, operation, or maintenance activities would be a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation could affect the flow regime of all of the streams, or the storage conditions of all of the reservoirs, included in the Secondary Study Area. However, the primary hazardous material issue of concern in this study area is the acid mine runoff from the Iron Mountain Mine Superfund site in the Spring Creek watershed. Historical gold mining and associated mercury contamination in the environment are also hazardous material concerns in this area, as well as in the other watersheds within the Secondary Study Area. Project operational modeling indicates no change in Spring Creek Reservoir water levels or releases, or in Spring Creek dilution flows. Because no Project construction would occur in this area, no Project-related soil or sediment disturbance would occur. As a result, the existing risk of soil and sediment contamination would not change from what currently occurs, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment

Refer to the **Impact Pub Health-1** discussion. The discussion also applies to the release of hazardous materials into the environment.

Impact Pub Health-3: Effects from Hazardous Emissions or Hazardous Materials, Substances, or Wastes within 0.25 Mile of an Existing or Proposed School

No Project construction, operation, or maintenance activities would occur within 0.25 mile of a school site in the Secondary Study Area, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site

No Project construction, operation, or maintenance activities would occur on a site in the Secondary Study Area that is included on any list of hazardous materials sites, including the list compiled pursuant to Government Code Section 65962.5. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation

Operational changes in the flow regime or storage conditions of the waterbodies included in the Secondary Study Area would not significantly impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan. There would, therefore, be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Installation of the pump at the Red Bluff Pumping Plant would require few vehicles and equipment, and its construction period would be short; therefore, it is not expected to significantly affect emergency response or evacuation procedures in that area. Similarly, its regular and routine maintenance activities are also expected to require few vehicles and take a short time to complete. This would result in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires

Operational changes in the flow regime or storage conditions of the waterbodies included in the Secondary Study Area would not be expected to expose people or structures to wildland fires, and would, therefore, have **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Pump installation and its associated operation and maintenance at the Red Bluff Pumping Plant would not be expected to expose people or structures to risks associated with wildland fires because the pump would be installed in an existing developed plant, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials

Project construction activities at all Primary Study Area Project facility sites have the potential to accidentally release hazardous materials during implementation of Alternative A.

In addition, Project maintenance activities would require the use of hazardous materials, such as fuels, oils, grease, and lubricants. Maintenance and repair of the equipment would be completed at the project facility site, or the equipment would be transported to nearby facilities.

The use, storage, handling, or disposal of hazardous materials could result in hazardous releases from equipment or through other means during Project construction and/or maintenance activities, thereby exposing workers to hazardous materials. There could also be accidental releases of hazardous materials that would contaminate soil or degrade water quality. The potential release of hazardous materials during construction, operation, or maintenance activities would be a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment

Refer to the Impact **Pub Health-1** discussion. The discussion also applies to the release of hazardous materials into the environment.

Impact Pub Health-3: Effects from Hazardous Emissions or Hazardous Materials, Substances, or Wastes within 0.25 Mile of an Existing or Proposed School

No Project construction, operation, or maintenance activities would occur within 0.25 mile of a school site, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site

The results of the agency database review indicate that no Project construction, operation, or maintenance activities would occur on a site that is included on any list of hazardous materials sites, including the list compiled pursuant to Government Code Section 65962.5.

It is possible that not all septic tanks, water wells, underground storage tanks, or other underground storage devices or conveyance systems have been identified on the published databases. These systems are considered as potential conduits for groundwater contamination. It is also possible that not all hazardous spills within the Primary Study Area were reported.

Although there would be no impact due to Project facilities being located on a listed hazardous materials site, there is the potential for Project facilities to be located near unlisted septic tanks, water wells, other underground storage devices, or unreported hazardous spills. Therefore, there would be a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation

Project construction equipment and materials would be transported on local roads to access the proposed Project facilities, with many over-sized Project vehicles traveling on the roads. This may result in a reduction in travel speeds on those roads throughout the Project construction period. In addition, some road closures and detours would be necessary during the Project construction period. This would result in a **potentially significant impact** on emergency and/or evacuation response if an emergency occurred in the vicinity of a Project facility during the Project construction period, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation is expected to increase traffic on local roads leading to the proposed recreation areas at the proposed Sites Reservoir. Sites Reservoir is expected to generate 360,975 Recreation Visitor Days (RVDs[7]) per year during the operation of Sites Reservoir. Therefore, the expected increased traffic on Maxwell Sites Road and County Roads 68, 69, and D during Project operation (primarily Fridays through Sundays during the recreation season[8]) would result in a **significant impact** on emergency and/or

[7] An RVD is defined as a recreation visit by one person for part or all of one day.

[8] The recreation season is typically defined as Memorial Day through Labor Day.

evacuation response at/near existing residences in the vicinity of Sites Reservoir during that time, when compared to Existing Conditions and the No Project/No Action Alternative.

Adding a recreation destination (Sites Reservoir) to the area is expected to increase the number of people in that area during the recreation season. An increase in the number of people in that area has the potential to increase the need for emergency and/or evacuation response, resulting in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative, although it is acknowledged that Colusa and/or Glenn County may be able to request mutual aid from other jurisdictions, including nearby cities, counties, the California OES, and ultimately, the Federal Emergency Management Agency (FEMA) if a catastrophic event occurred.

In addition, operation and maintenance of all Project facilities would increase traffic on local roads to the individual Project facilities when regular and routine tasks are scheduled to be performed. However, these activities are expected to be performed by a few trained individuals with few vehicles and equipment, resulting in a **less-than-significant impact** on emergency and evacuation response in the areas near Project facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires

The vegetation within the Primary Study Area creates an existing risk of fire hazard from natural hazards, such as lightning strikes, or from human activities that occur there. Project construction, operation, and maintenance activities within the Primary Study Area would increase the potential exposure of people, structures, infrastructure, and other resources to a significant risk of loss, injury, or death from fire.

Most of the proposed Project facilities would be constructed in rural undeveloped areas that have trees, grasses, and shrubs. Project construction activities would likely occur during the summer and fall months, which are generally considered a time of high fire hazard in northern California.

Construction workers traveling to the Project facility sites and construction materials being transported to the construction sites would increase the risk of fire hazard along their travel route. Operation of vehicles throughout the area, particularly when vegetation adjacent to roads is dry, can increase the fire potential from accidental combustion (e.g., sparks), hot metal (e.g., tail pipes, motors), or traffic accidents.

Project construction activities at individual Project facility locations would increase the risk of fire hazard at those locations due to the presence of construction and worker vehicles and equipment (i.e., combustion engines), the presence of fuels, lubricants, and other flammable substances at the Project facility sites, and the presence of construction workers at the Project sites, if they smoke when there.

Vegetation clearing that would be required as part of Project construction, both at Project facility sites and within Project disturbance areas, would reduce the overall fuel loading in those areas, thereby reducing the long-term fire hazard. In addition, filling Sites Reservoir, TRR, and Holthouse Reservoir with water would reduce the long-term fire hazard at those locations. However, the presence of the construction vehicles and equipment operating in those areas when the facilities are being constructed would increase the fire hazard risk at the facility sites. Project implementation could also result in additional water supplies being available in the Primary Study Area, which could assist in future firefighting responses.

Operation and maintenance activities at Project facilities would occur on a regular basis, and would require the use of vehicles and equipment (also combustion engines) that would increase the risk of fire hazard at those locations when those activities are being performed.

Visitors to the proposed recreation areas at the proposed Sites Reservoir would also increase the risk of fire hazard in those areas. Potential fire sources include campsites, campfires, vehicles, and watercraft.

Therefore, the existing fire hazard risk would be increased during Project construction, operation, and maintenance periods, resulting in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Pub Health-7: Create a Safety Hazard for People Residing or Working in the Project Area (if Located within an Airport Land Use Plan or within Two Miles of a Public Airport or Public Use Airport if no Plan has been Adopted)

A review of County Zoning Maps (Glenn County, 2006 and Colusa County, 2011) indicated that Project facilities would not be located within designated airport zones. The closest airport to a Project facility is the Willow-Glenn County Airport, located approximately 0.9 mile west of the GCID Canal Railroad Siphon. No Project construction, operation, or maintenance activities would occur within or near a public airport; therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

28.3.6.2 Mosquitoes, Other Vectors, and Nuisance Problems

Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use and Municipal and Industrial Water Use

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

Alternative A does not include any construction or subsequent maintenance of Project-related facilities within the Extended Study Area, so there would be **no impact** from increased exposure to nuisance problems, or to/from existing mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses within the Extended Study Area from those activities, when compared to Existing Conditions and the No Project/No Action Alternative.

The operation of Alternative A would result in increased water supply reliability to agricultural, municipal, and industrial uses. However, Alternative A would result in approximately 19,000 fewer acres in agricultural land use, when compared to Existing Conditions, and 2,000 more acres in agricultural land use, when compared to the No Project/No Action Alternative (refer to Chapter 22 Socioeconomics Table 22-27). These changes in agricultural acreage are expected to result in little to no change in exposure to nuisance problems, or in mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses within the Extended Study Area, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Wildlife Refuge Water Use

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

Operational modeling indicates that the amount of Level 4 wildlife refuge water supply would be the same every year with or without the Project. Project operations would provide an alternate source of Level 4 wildlife refuge water in some years, but would not increase its reliability. Therefore, the provision of an alternate source of Level 4 wildlife refuge water supply would have **no impact** on exposure to nuisance problems, or to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses, when compared to Existing Conditions and the No Project/No Action Alternative.

San Luis Reservoir

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

San Luis Reservoir currently experiences severe water level fluctuations. Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that operation of the Project would cause San Luis Reservoir water levels to continue to fluctuate, but the fluctuations could be more severe. Water fluctuations within the reservoir can create an environment conducive to mosquito habitat and subsequent mosquito population growth. The Merced County Mosquito Abatement District has established existing mosquito abatement controls for the county. In addition, land uses surrounding the reservoir, including adjacent Pacheco State Park, have an established ecosystem which supports mosquito predators, such as frogs, bats, and birds. In addition to mosquito abatement, other vector controls are in place due to the public recreational use of Pacheco State Park and San Luis Reservoir. Water fluctuations at the reservoir would not be expected to increase exposure to nuisance species. Therefore, the impact resulting from Project operation at this reservoir in the Extended Study Area is considered **less than significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

Installation of an additional pump into an empty bay within the existing Red Bluff Pumping Plant (a developed site) would not affect exposure to nuisance problems or mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses at that location, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the pump and maintenance of the canal's intakes would occur as part of the operation and maintenance routine that occurs at those facilities, resulting in no change in exposure to nuisance problems, and no change to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses from what currently occurs. Therefore, **no impact** would occur as a result of the operation and maintenance of the additional pump, when compared to Existing Conditions and the No Project/No Action Alternative.

No direct Project-related construction or maintenance activity would occur within the Secondary Study Area at the other locations listed above. Therefore, there would be no change in exposure to nuisance problems, and no change to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses at the locations listed above from Project-related construction or maintenance activities, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operation could affect the flow regime of all of the above-listed streams and/or the storage conditions of all of the above-listed reservoirs that are located in the Secondary Study Area. River flows and reservoir water level fluctuations resulting from Alternative A are expected to be within the historic range of operations, resulting in no change in exposure to nuisance problems, and no change to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

All Primary Study Area Project Facilities

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

Construction sites are generally flat and have the potential to create ponding areas after a rainstorm. Large ponding areas that do not completely dry after three to five days are conducive to mosquito breeding and can contribute to mosquito population growth. In addition, to satisfy NPDES stormwater permit requirements, some construction contractors create drainage ditches and subsequent retention ponds at Project construction sites to prevent stormwater runoff from entering nearby waterbodies. These ponds also have the potential for becoming mosquito breeding grounds, resulting in a **potentially significant impact** at all Project facility construction sites, when compared to Existing Conditions and the No Project/No Action Alternative.

The construction and filling of the three proposed reservoirs (Sites, Holthouse, and the TRR), plus the forebay and afterbay that would be constructed at the Delevan Pipeline Intake Facilities, would create an increase in total surface water area and reservoir shoreline. Increased surface water area would create habitat suitable for mosquito egg deposition. Increased shoreline also would result in favorable mosquito habitat for floodwater mosquitoes, particularly if water levels are expected to fluctuate greatly, as is the case with the Project facilities. Impacts to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses at the new reservoirs would result in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Although surface water fluctuations occur at the existing Funks Reservoir, operation of the proposed expanded reservoir (i.e., Holthouse Reservoir) would result in more varied surface water fluctuations. These fluctuations in water levels can create favorable conditions for floodwater mosquito habitat increasing the potential for mosquito growth. However, there are established mosquito controls in place to abate mosquito growth at Funks Reservoir that would continue to be implemented during Project operation. Therefore, impacts to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses at Holthouse Reservoir would result in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative**.**

Site Reservoir is intended for water storage as well as for recreational use. Recreational use would be facilitated by the establishment of up to five recreation areas with hiking trails, picnic areas, camping areas, a swimming area, and boat ramps. Because these recreation areas would be open to the public, mosquito abatement is a priority to decrease the risk of spreading disease. Although existing mosquito abatement controls are in use in Colusa County, the maintenance and operational activities due to the establishment of the Sites Reservoir and associated recreation areas may result in increased impacts to/from mosquito or vector populations, habitat, controls, or the spread of mosquito- or vector-borne illnesses. This would result in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

In addition to impacts to/from mosquitoes at Sites Reservoir and the recreation areas, impacts from rodents, flies, bees, yellowjackets, and stinging ants, as well as Giardia and Swimmer's Itch may be expected. The recreation areas are proposed to include picnic areas, camping areas, swimming beaches, boat ramps, wildlife viewing vistas, and hiking trails. In many of these areas, food would be eaten, which would attract foraging bees, yellowjackets, stinging ants, flies, and rodents. Over time, these species may develop nests and reproduce within the recreation areas. Recreationists using the swimming areas could potentially be exposed to Giardia, Swimmer's Itch, or liver flukes. Impacts from rodents, flies, bees, yellowjackets, and stinging ants, as well as Giardia and Swimmer's Itch, would require controls to abate health and nuisance problems, and are considered **potentially significant,** when compared to Existing Conditions and the No Project/No Action Alternative.

The location of the proposed Sites Reservoir supports small areas of forested woodlands and large areas of grassland, which provide suitable habitat for rattlesnakes, ticks, conenose bugs and poison oak. These areas would likely be part of the trail system within the recreation areas, exposing recreationists to the potential for being bitten by rattlesnakes, being exposed to poison oak, being bitten by conenose bugs, and being bitten by ticks and potentially contracting Lyme disease or Rocky Mountain spotted fever. This increased risk would result in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

28.3.7 Impacts Associated with Alternative B

28.3.7.1 Hazardous Materials and Wildland Fires

<u>Extended and Secondary Study Areas – Alternative B</u>

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to the transport, use, or disposal of hazardous materials (**Impact Pub Health-1**), release of hazardous materials into the environment (**Impact Pub Health-2**), hazardous emissions, materials, substances, or wastes in the vicinity of a school (**Impact Pub Health-3**), projects being located on a listed hazardous materials site (**Impact Pub Health-4**), effects on emergency response or evacuation plan implementation (**Impact Pub Health-5**), and wildland fire risk (**Impact Pub Health-6**) would be the same as described for Alternative A for the Extended and Secondary study areas.

<u>Primary Study Area – Alternative B</u>

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public and environmental hazards:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The remaining Primary Study Area Project facilities have different designs for Alternative B than for Alternative A: The Alternative B Sites Reservoir would be larger than the Alternative A reservoir and would consequently alter the size and location of the dams; the road relocations associated with Alternative B differ from those for Alternative A, mostly due to changes to the saddle dam access roads; the Alternative B design for the Delevan Transmission Line would be much shorter than the Alternative A design; the Alternative B Delevan Pipeline Discharge Facility would replace the Alternative A Delevan Pipeline Intake Facilities; and the area included in the Project Buffer would change because the size of some of the facilities surrounded by the Project Buffer would change. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on the transport, use, or disposal of hazardous materials (**Impact Pub Health-1**), release of hazardous materials into the environment (**Impact Pub Health-2**), hazardous emissions, materials, substances, or wastes in the vicinity of a school (**Impact Pub Health-3**), Projects being located on a listed hazardous materials site (**Impact Pub Health-4**), effects on emergency response or evacuation plan implementation (**Impact Pub Health-5**), wildland fire risk (**Impact Pub Health-6**), and aircraft safety hazards (**Impact Pub Health-7**) as described for Alternative A.

28.3.7.2 Mosquitoes, Other Vectors, and Nuisance Problems

<u>Extended and Secondary Study Areas – Alternative B</u>

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to increased risk of exposure to mosquito- or vector-borne illnesses or to nuisance problems (**Impact Pub Health-9**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public health from mosquitoes, other vectors, and nuisance problems:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprint or construction disturbance area of Sites Reservoir Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility. However, these differences in the size of the footprint or alignment of the construction disturbance area would require the same type of construction, operation, and maintenance activities as was described for Alternative A. They would, therefore, have the same impact to public health from the potential exposure to mosquito or vector populations, habitat, and the spread of mosquito- or vector-borne illnesses, and to exposure to nuisance problems (**Impact Pub Health-9**), within the Primary Study Area as described for Alternative A, with the exclusion of the potential impacts associated with the Delevan Pipeline Intake Facility forebay and afterbay that are included in Alternative A, but not Alternative B. Because Alternative B would not have a forebay and afterbay at that location, potential impacts to mosquito or vector populations, habitat, and the spread of mosquito- or vector-borne illnesses at that location would be less for Alternative B than described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact to increased risk of exposure to mosquito- or vector-borne illnesses or to nuisance problems (**Impact Pub Health-9**) as described for Alternative A.

The differences associated with the larger Alternative B Sites Reservoir and its impacts to public health from mosquitoes, other vectors, and nuisance problems are described below.

Sites Reservoir Inundation Area

Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems

The establishment of the larger capacity Sites Reservoir associated with Alternative B would create more shoreline and increased water surface area, both of which contribute to favorable habitat for mosquitoes and several vectors. These changes would require slightly more mosquito and/or vector abatement resources than for Alternative A, and the operational and maintenance impacts are considered **potentially significant** (i.e., the same as described for Alternative A), when compared to Existing Conditions and the No Project/No Action Alternative.

28.3.8 Impacts Associated with Alternative C

28.3.8.1 Hazardous Materials and Wildland Fires

Extended, Secondary, and Primary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to the transport, use, or disposal of hazardous materials (**Impact Pub Health-1**), release of hazardous materials into the environment (**Impact Pub Health-2**), hazardous emissions, materials, substances, or wastes in the vicinity of a school (**Impact Pub Health-3**), Projects being located on a listed hazardous materials site (**Impact Pub Health-4**), effects on emergency response or evacuation plan implementation (**Impact Pub Health-5**), and wildland fire risk (**Impact Pub Health-6**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public and environmental hazards:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard

- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as the Alternative A design. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public and environmental hazards as described for Alternative A.

The Alternative C design for the Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge are the same as the Alternative B design. These facilities would require the same construction, operation, and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public and environmental hazards as described for Alternative B.

The boundary of the Project Buffer is the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are included in the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the construction, operation, and maintenance impacts to public and environmental hazards that were described for Alternative A.

28.3.8.2 Mosquitoes, Other Vectors, and Nuisance Problems

Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to increased risk of exposure to mosquito- or vector-borne illnesses or to nuisance problems (**Impact Pub Health-9**), would be the same as described for Alternative A for the Extended and Secondary study areas.

Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public health from mosquitoes, other vectors, and nuisance problems:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR

- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public health from mosquitoes, other vectors, and nuisance problems as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public health from mosquitoes, other vectors, and nuisance problems as described for Alternative B.

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the construction, operation, and maintenance impacts to public health from mosquitoes, other vectors, and nuisance problems that were described for Alternative A.

28.4 Mitigation Measures

28.4.1 Hazardous Materials and Wildland Fires

Mitigation measures are provided below and summarized in Table 28-4 for the impacts that have been identified as significant or potentially significant.

Table 28-4
Summary of Mitigation Measures for
NODOS Project Impacts to Public Health from Hazardous Materials and Wildland Fires

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Pub Health-1: Create a Significant Public or Environmental Hazard from the Routine Transport, Use, or Disposal of Hazardous Materials	All Project facility sites (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant
Impact Pub Health-2: Create a Significant Public or Environmental Hazard from the Release of Hazardous Materials into the Environment	All Project facility sites (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan	Less than Significant

Table 28-4
Summary of Mitigation Measures for
NODOS Project Impacts to Public Health from Hazardous Materials and Wildland Fires

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Pub Health-4: Create a Significant Hazard to the Public or the Environment from the Project being Located on a Listed Hazardous Materials Site	All Project facility sites (construction,)	Potentially Significant	Mitigation Measure GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems	Less than Significant
			Mitigation Measure Pub Health-4: Dispose of Hazardous Waste Discovered during Project Construction Pursuant to CERCLA Requirements	Less than Significant
Impact Pub Health-5: Effects on Adopted Emergency Response Plan or Emergency Evacuation Plan Implementation	All Project facility sites (construction, operation, and maintenance)	Potentially Significant and Significant	Mitigation Measure Trans-1: Prepare and Implement a Project Operation Traffic Control Plan	Less than Significant
			Mitigation Measure Trans-3: Prepare and Implement a Project Construction Traffic Control Plan	Less than Significant
Impact Pub Health-6: Expose People or Structures to a Significant Risk of Loss, Injury, or Death from Wildland Fires	All Project facility sites (construction, operation, and maintenance)	Potentially Significant	Mitigation Measure Pub Health-6: Develop and Implement a Project Fire Prevention and Suppression Plan and Consult with Fire Protection Agencies	Less than Significant

Notes:
BMPs = Best Management Practices
LOS = Level of Significance

Mitigation Measure SW Qual-1e: Prepare and Implement a Stormwater Pollution Prevention Plan

DWR and Reclamation shall prepare and implement a SWPPP that emphasizes proper hazardous materials storage and handling procedures; shall outline spill containment, cleanup, and reporting procedures; and shall limit refueling and other hazardous activities to designated upland areas. Signs prohibiting refueling shall be posted in sensitive areas. Equipment shall be inspected prior to use each day to ensure that hydraulic hoses are tight and in good condition. Other appropriate BMPs, such as use of concrete washout basins and proper waste management, combined with visual observation and water sample collection and analysis, shall be used to prevent discharge of drilling mud and other chemicals associated with construction activities and into receiving waters. Details of these BMPs are described in Section WM-4 of the Construction Site Best Management Practices Manual (Caltrans, 2003).

Mitigation Measure GW Qual-1b: Implement DWR and County Standards for the Proper Abandonment of Wells, Boreholes, and Septic Systems

According to DWR's Water Well Standards (DWR, 2012), a well that is no longer useful (including exploration and test holes) must be destroyed to assure that the existing groundwater quality and proposed Project water quality is protected and preserved for further use, and to eliminate any potential physical hazard. Destruction of a well shall consist of the complete filling of the well in accordance with the procedures described in DWR Water Well Standards Section 23. Permits for well destruction shall also be obtained from the appropriate County agency (Glenn or Colusa).

Any current or historic oil and gas wells detected within the Project facility footprints shall be addressed. Any well types that would be inundated shall be properly sealed and abandoned according to policies and procedures laid out in the California Code of Regulations Title 14 from the Department of Conservation. These wells shall be sealed to ensure that the existing groundwater quality is protected and preserved, and to eliminate any potential physical hazard. Permits for well destruction shall also be obtained from the appropriate County agency (Glenn or Colusa).

Any test holes, boreholes, other potential conduits to groundwater shall also be sealed and destroyed.

Existing septic systems, such as septic tanks, cesspools, and seepage pits, shall be identified and located. These septic systems shall then be properly abandoned and demolished, and, if necessary, removed and disposed of. Destruction of septic systems shall require:

- A licensed septic tank pumper to pump the septic tank. A copy of the receipt for this pumping shall be obtained.
- Abandonment of the tank in accordance with county ordinances, which may include methods such as:
  - Tank removed, then disposed of at a sanitary landfill
  - Tank top removed, tank crushed, then excavation filled with earthen materials to within 12 inches of native surface
  - Tank top removed, bottom perforated, then excavation filled with earthen materials to within 12 inches of native surface

Permits for abandonment and destruction shall also be obtained from the appropriate County (Glenn or Colusa) prior to work.

Mitigation Measure Pub Health-4: Dispose of Hazardous Waste Discovered during Project Construction Pursuant to CERCLA Requirements

If evidence of contaminated materials is encountered during Project construction, construction shall cease immediately and applicable requirements of the Comprehensive Environmental Release Compensation and Liability Act (CERCLA) and the CCR Title 22 regarding the disposal of waste shall be implemented.

Mitigation Measure Trans-1: Prepare and Implement a Project Operation Traffic Control Plan

DWR and Reclamation shall prepare and implement an Operation Traffic Control Plan for the Project. Consultation with Glenn and Colusa counties shall occur to determine what those agencies would require to manage the traffic congestion that is expected to occur as a result of recreationists traveling to Sites Reservoir and its Recreation Areas. It is possible that the Counties may want to wait to do any road improvements until a recreation season (or more) has passed, so that actual recreation visitation and associated traffic congestion on local roadways could be monitored.

Consultation and coordination with Caltrans shall also occur to manage traffic at onramps and offramps from I-5 that would connect to the County roads leading to Sites Reservoir and its Recreation Areas.

Consultation with local fire and sheriff departments shall occur to obtain input regarding maintaining adequate emergency response times and access to properties along the roads that comprise the routes to Sites Reservoir and its Recreation Areas.

The Operation Traffic Control Plan may include, but not be limited to, ideas such as:

- Widening the existing County roads that comprise the primary route to Sites Reservoir and its Recreation Areas, and maintaining such roads
- Signalizing or signage at intersections along the primary route to Sites Reservoir and its Recreation Areas
- Developing alternate routes to Sites Reservoir that would intersect at Maxwell Sites Road and signalizing that intersection
- Providing bus service to Sites Reservoir and its Recreation Areas and providing a Park and Ride Lot at the bus pickup location
- Provisions for maintaining emergency vehicle access (detailed measures to be developed in coordination with the local sheriff and fire departments)
- Provisions to reduce potential school bus delays that may occur as a result of Project recreation visitation traffic (detailed measures to be developed in coordination with the local school district and sheriff departments)
- Directional roadway signage to Sites Reservoir and its Recreation Areas

The Operation Traffic Control Plan shall be prepared in coordination with, and approved by, affected agencies, such as Caltrans, Glenn County, Colusa County, and Maxwell Unified School District.

Mitigation Measure Trans-3: Prepare and Implement a Project Construction Traffic Control Plan

DWR and Reclamation shall prepare and implement a Construction Traffic Control Plan for the Project. The Construction Traffic Control Plan shall include, but would not be limited to, the following measures that are intended to manage:

- Construction-related traffic
- Temporary and/or permanent bus reroutes
- Pavement repairs before and after construction
- Measures to reduce emergency vehicle delay and maintain emergency vehicle access (detailed measures to be developed in coordination with the local sheriff and fire departments)
- Measures to accommodate potential school bus reroutes and reduce potential school bus delays (detailed measures to be developed in coordination with the school district and sheriff departments)
- Construction site parking
- Construction signage

The Construction Traffic Control Plan shall be prepared in coordination with, and approved by, affected agencies, such as Caltrans, Glenn County, Colusa County, and Maxwell Unified School District.

Mitigation Measure Pub Health-6: Develop and Implement a Project Fire Prevention and Suppression Plan and Consult with Fire Protection Agencies

DWR and Reclamation shall include in the construction contract specifications the following requirements. Prior to the start of Project construction, the construction contractor shall coordinate with the fire protection agencies that would serve the Primary Study Area regarding their requirements for preventing and suppressing fires during Project construction, operations, and maintenance. This effort shall include the preparation and implementation of a Project Fire Prevention and Suppression Plan that shall provide requirements that the contractor(s) shall follow while constructing Project facilities. The Plan shall also provide requirements for operation and maintenance activities. The Plan shall include, but shall not be limited to, the following requirements:

- Equip all diesel and/or gasoline-operated engines (stationary and mobile) with spark arresters
- Provide fire-fighting equipment on each piece of heavy equipment and construction vehicle
- Clear equipment service areas, parking areas, and gas and oil storage areas of all flammable material
- Prohibit smoking at Project facility construction sites during fire season, except in barren areas or in an area cleared to mineral soil at least three feet in diameter (CPRC 4423.4). In areas closed to smoking, the permit administrator may approve special areas to be used for smoking. The Contractor shall assign designated smoking areas. Signs shall be posted at Project facility construction sites regarding smoking and fire rules in conspicuous places. Under no circumstances shall smoking be permitted during fire season while workers are operating light or heavy equipment, or walking or working in grass and woodlands.
- Confine welding activities to cleared areas having a minimum specified radius

- Furnish a full water tank truck with fire hose at Project facility sites
- Maintain minimum vegetation clearance distances
- Establish long-term fuel management requirements
- Notify the local fire protection agencies of any fires along roads or within or near the Project facility sites as soon as feasible, after initial control action is taken
- Provide an on-site fire patrol person who shall patrol all Project facility sites during Project construction for the purpose of preventing and detecting fires and taking suppression action where necessary
- Furnish an agreed upon communications system connecting each Project facility construction site with the local fire protection agencies

In addition, DWR and Reclamation shall include into the construction contract specifications the following requirement:

- Prepare a Project-specific Emergency Evacuation Plan that includes a Project-specific contingency plan for fires, and submit the Plan to the agency or agencies with jurisdiction before Project site activities commence.

Implementation of **Mitigation Measures SW Qual-1e, GW Qual-1b, Pub Health-4, Trans-1, Trans-3**, and **Pub Health-6** would reduce the level of significance of Project impacts from public and environmental hazards to **less than significant**.

28.4.2 Mosquitoes and Other Vectors

Mitigation measures are provided below and summarized in Table 28-5 for the impacts that have been identified as significant or potentially significant.

Table 28-5
Summary of Mitigation Measures for NODOS Project Impacts to Public Health from Mosquito or Vector Populations, Habitat, and the Spread of Mosquito- or Vector-Borne Illnesses

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Pub Health-9: Expose People to an Increased Risk of Mosquito-Borne or Other Vector-Borne Illnesses, or Increased Exposure to Nuisance Problems	All Project facility sites where ponding would occur (construction)	Potentially Significant	Mitigation Measure Pub Health-9a: Develop and Implement a Stormwater Pollution Prevention Plan	Less than Significant

Table 28-5
Summary of Mitigation Measures for NODOS Project Impacts to Public Health from Mosquito or Vector Populations, Habitat, and the Spread of Mosquito- or Vector-Borne Illnesses

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Sites Reservoir, Recreation Areas, Holthouse Reservoir, TRR, and the forebay and afterbay at the Delevan Pipeline Intake Facilities (operation and maintenance)	Potentially Significant	Mitigation Measure Pub Health-9b: Develop and Implement a Mosquito, Vector, and Other Nuisance Problems Control Plan	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Pub Health-9a: Develop and Implement a Stormwater Pollution Prevention Plan

The Project construction contractor shall develop and implement a Stormwater Pollution Prevention Plan that includes, but is not limited to, BMPs for minimizing on-site stormwater. In addition, the Plan shall include measures to minimize construction worker exposure to mosquitoes.

Mitigation Measure Pub Health-9b: Develop and Implement a Mosquito, Vector, and Other Nuisance Problems Control Plan

DWR and Reclamation shall prepare and implement a Mosquito, Vector, and Other Nuisance Problems Control Plan for the Project, in consultation with the Glenn County Mosquito and Vector Control District and the Colusa Mosquito Abatement District. This Plan shall include, but not limited to, the following:

- Conduct routine inspection and virus surveillance activities within the Sites Reservoir and its Recreation Areas, as well as the TRR and Holthouse reservoirs, and the forebay/afterbay at the Delevan Pipeline Intake Facility.
- Site managers shall eliminate unnecessary standing water in containers, old tires, or trash receptacles,
- Clean all rain gutters, storm drains, or similar features that could capture water.
- Minimize places where mosquitoes, ticks, rodents, or rattlesnakes may inhabit by removing heavy brush, trimming and pruning landscape shrubs, and mowing grass areas regularly.
- Install bird nesting boxes to encourage birds that feed on mosquitoes, midges and other vectors or nuisance species.
- Stock the reservoirs with fish that feed on mosquito larva and pupa.
- Provide printed materials at each recreation area that informs the recreationists (particularly recreationists using the Sites Reservoir and hikers using the trail system) to protect against mosquito, tick, stinging insect, flea, rattlesnake bites, poison oak, and to minimize exposure to Giardia and Swimmer's Itch. Such information shall include, but is not limited to, instructions to: (1) wear clothing that covers arms and legs and use a repellant that contains DEET; (2) never go barefoot or

wear sandals when walking through wild areas (wear hiking boots); (3) stick to well-used trails when hiking; (4) avoid tall grass, weeds, and heavy underbrush; (5) never step or put your hands where you cannot see, and avoid wandering around in the dark; (6) step on logs and rocks, never over them, and be especially careful when climbing rocks or gathering firewood; (7) check out stumps or logs before sitting down, and shake out sleeping bags before use; (8) never grab "sticks" or "branches" while swimming in lakes and rivers (rattlesnakes can swim); (9) never hike alone (always have someone with you who can assist in an emergency); (10) never handle a freshly killed snake (it can still inject venom); (11) teach children to respect snakes and to leave them alone; (12) avoid contact with wild rodents and their fleas, especially sick rodents; (13) minimize pet contact with rodents; (14) never camp near animal burrows; (15) never feed rodents; (16) store food and garbage in closed containers; and (17) explain how to identify poison oak and include a photo of poison oak leaves.

- Conduct routine inspections of all pipelines and other water conveyance structures for aboveground leaks that could create standing water. Repair all leaks in a timely manner.
- Provide covered trash receptacles within the recreation areas. Perform timely and frequent emptying of trash receptacles and cleanup of food spillage. Provide signs that encourage recreationists at these areas to cover and store food promptly after eating, and to properly dispose of food packaging and waste. Encourage recreationists to leave the areas as clean as possible to discourage foraging rodents, flies, and biting/stinging insects.
- Conduct routine inspections of property for stinging insect nests and remove them, if necessary, to avoid public health or nuisance issues.
- Promptly remove from property all dead animals, carnage, or animal feces.

Implementation of **Mitigation Measures Pub Health-9a** and **Pub Health-9b** would reduce the level of significance of Project impacts to public health from mosquitoes, other vectors, and nuisance problems to **less than significant**.

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Figure

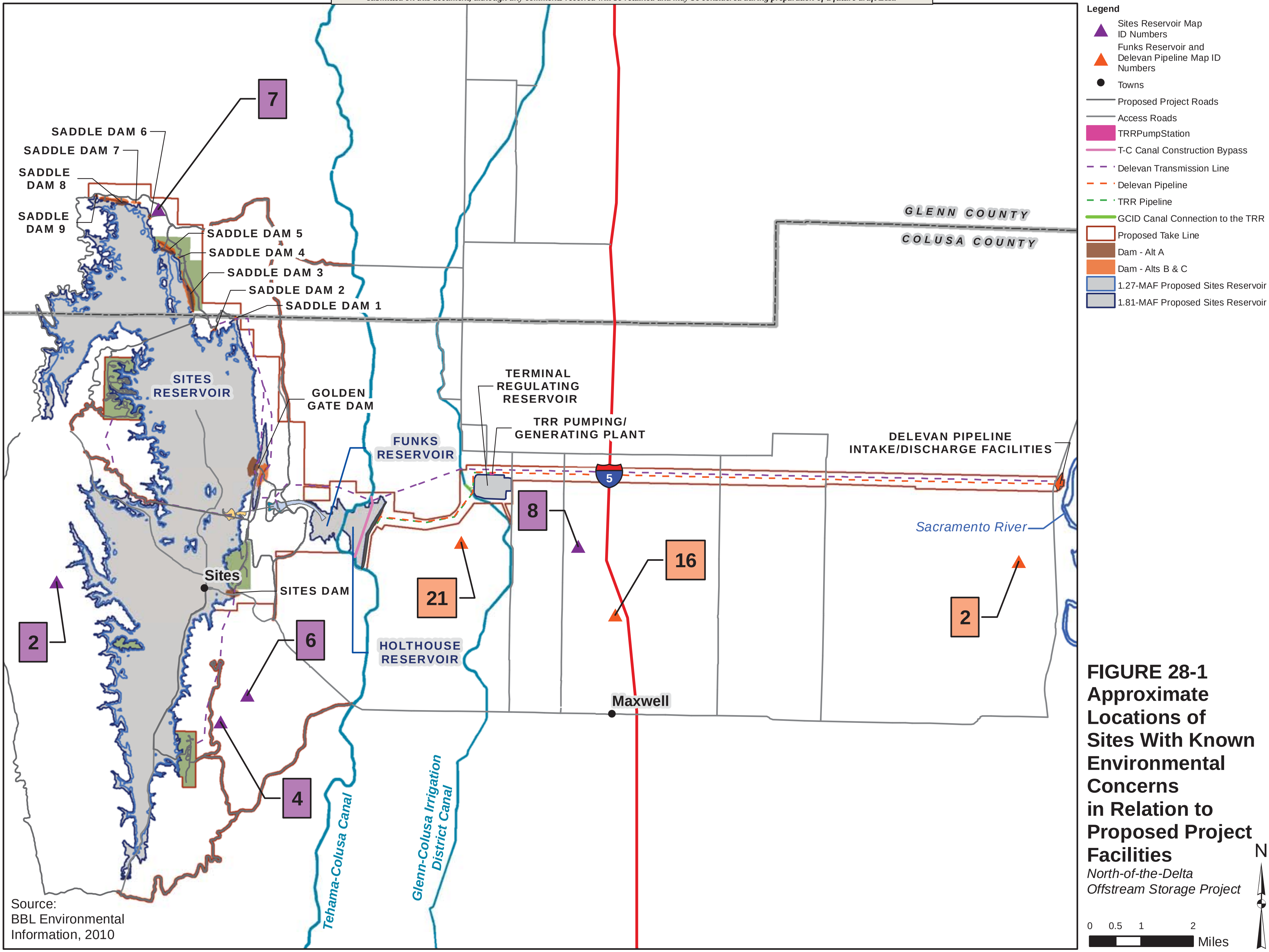

FIGURE 28-1
Approximate Locations of Sites With Known Environmental Concerns in Relation to Proposed Project Facilities
North-of-the-Delta Offstream Storage Project

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29. Public Services and Utilities

29.1 Introduction

This chapter describes the public services and utilities setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Public services include schools, hospitals/medical centers, and police and fire protection services. Utilities include water, wastewater, solid waste, natural gas, electricity, telephone, and cable providers.

The regulatory setting for public services and utilities is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

29.2 Environmental Setting/Affected Environment

29.2.1 Methodology

The identification of existing public services and utilities for the three study areas was performed by conducting a review of planning documents, consultation of websites, and by telephone and email communications with representatives of area agencies to identify and describe existing public services (schools, fire protection/emergency medical services, and law enforcement) and existing utilities (water, wastewater, drainage, energy, solid waste disposal) facilities and systems.

29.2.2 Extended and Secondary Study Areas

29.2.2.1 Public Services

Schools

The counties, cities, and communities in the Extended and Secondary study areas have both public (alternative, magnet, thematic, and charter) and private (religious and non-religious) schools. The public schools are under the jurisdiction of various public school districts.

Medical Care

There are many medical centers that serve the counties, cities and communities within the Extended and Secondary study areas. These hospitals/medical centers provide general medical and surgical care, emergency services, women's health, children's health, imaging services, and outpatient services (USA Hospitals, 2010).

Police Protection

The counties in the Extended and Secondary study areas are served by County Sheriff's departments/offices that are responsible for law enforcement services in the unincorporated areas of the counties. The County Sherriff departments typically administer the County Jails, function as the County

Coroner/Crime Lab, and act as the Office of Emergency Services (USA COPS, 2010). Law enforcement services are also provided by police departments within the individual cities (USA COPS, 2010), and also by the California Highway Patrol (CHP). The CHP is the primary law enforcement agency for state highways and roads. Its services include law enforcement, traffic control, accident investigation, and the management of hazardous materials spill incidents.

Fire Protection

Various fire departments and fire districts serve counties, cities, and communities in the Extended and Secondary study areas. Fire department/districts are staffed by paid workers, and volunteers in some instances.

29.2.2.2 Utilities

Water

Various municipal and agricultural water districts serve the counties, cities, and communities in the Extended and Secondary study areas from a variety of surface and groundwater sources. The water is conveyed through pipelines to water treatment systems operated by various water districts (special service districts or municipalities). The treated water is then distributed through a grid system that serves the incorporated areas and some of the rural neighborhoods adjoining the incorporated areas. Irrigation water is conveyed through canals operated by irrigation water districts to the agricultural lands where the water is applied.

Wastewater

Wastewater in the Extended and Secondary study areas is treated and returned to the environment using both on-site disposal and centralized disposal. The areas served by on-site systems are generally rural or agricultural. More populous areas have a wastewater treatment facility (centralized disposal) in which a series of underground pipelines convey wastewater from residences and businesses to a wastewater treatment plant for treatment before release to local waterways.

Solid Waste

Solid waste in the Extended and Secondary study areas is disposed of by individual public works departments and contracted private waste handling companies in the counties. Solid waste in these areas is transported to commercial Class I, II, and III landfills. Class I sites may accept hazardous and nonhazardous wastes; Class II sites may accept "designated" and nonhazardous wastes; and Class III sites may accept nonhazardous wastes. Examples of Class I landfills are Chem Waste Management-Kettleman in Kings County, and Safety-Kleen-Buttonwillow in Kern County. Examples of Class II landfills are Altamont Sanitary Landfill in Alameda County, Aqua Clear Farms Inc. in Solano County, and Ostrom Road Landfill in Yuba County. Examples of Class III landfills are Kiefer Landfill in Sacramento County, Red Bluff Landfill in Tehama County, Weaverville Landfill in Trinity County, and West Central Landfill in Shasta County.

Natural Gas

Natural gas is provided via a system of underground pipelines of varying diameters to residences and businesses throughout the Extended and Secondary study areas by PG&E, Southern California Gas (SoCalGas), San Diego Gas & Electric (SDG&E), Southwest Gas, and several smaller natural gas utilities (CPUC, 2010).

Electricity

Electricity is provided to the residences and businesses throughout the Extended and Secondary study areas by a combination of overhead and underground transmission and distribution lines. High voltage (> 230-kV) electricity is generated and transmitted throughout California (and also generated in other states, with some electricity being imported to California) and is stepped down in voltage for residential, commercial, and industrial land uses. Examples of providers include Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), municipal utilities, and San Francisco Public Utilities Commission (SFPUC).

Telephone

Telephone service (both land lines and cellular service) is provided by several companies in the Extended and Secondary study areas by a variety of providers such as AT&T, Comcast, Southern California Telephone Company, Sprint, Frontier Communications, Vonage, and Verizon.

Cable

Cable service for the television and internet is provided by a series of overhead and underground lines in the Extended and Secondary study areas. Service is provided by a variety of providers including AT&T, Comcast, and Time Warner Cable.

29.2.3 Primary Study Area

The Primary Study Area includes the areas where proposed Project facilities would be constructed. For data collection purposes, public services, facilities, and utilities are discussed at the County level (Glenn and Colusa counties). In addition, the existing communication tower on Logan Ridge (located on the southeast side of the proposed Sites Reservoir) is not a Project facility; however, its access would be affected by the Project, so a new road to access it is included in the Project, and it is discussed as part of the Primary Study Area.

29.2.3.1 Public Services

Schools

Glenn County

In 2009, there were 36 public schools within Glenn County, including 10 elementary/primary schools, two junior high/middle schools, five high schools, and 19 other types of schools (including continuation, community day, juvenile court, and special education) (Ed-Data, 2009). Additional educational opportunities are provided through the Butte-Glenn Community College District. Table 29-1 characterizes each public school in the County. Table 29-2 lists the school bus routes for each of the public school districts in the county.

Table 29-1
Glenn County Schools

School Name	District	School Address	Lowest Grade	Highest Grade	Total # of Students	Full-Time Staff
Bidwell Point High (Continuation)	Stony Creek Joint Unified	300 Sanhedrin Road Elk Creek, CA	9th	9th	1	0
Capay Joint Union Elementary	Capay Joint Union Elementary	7504 Cutting Avenue Orland, CA	K*	8th	146	7
Elk Creek Elementary	Stony Creek Joint Unified	300 Sanhedrin Road Elk Creek, CA	K*	4th	39	4
Elk Creek Junior-Senior High	Stony Creek Joint Unified	300 Sanhedrin Road Elk Creek, CA	7th	12th	40	4
Ella Barkley High	Hamilton Union High	300 Hwy. 32 Hamilton City, CA	10th	12th	16	1
Fairview Elementary	Orland Joint Unified	1308 Fairview Street Orland, CA	3rd	5th	520	24
William Finch	Glenn County Office of Education	311 South Villa Avenue Willows, CA	K*	12th	128	7
Glenn County Juvenile Court	Glenn County Office of Education	311 South Villa Avenue Willows, CA	9th	12th	13	1
Glenn County Opportunity School	Glenn County Office of Education	311 South Villa Avenue Willows, CA	7th	12th	31	5
Glenn County Special Education School	Glenn County Office of Education	311 South Villa Avenue Willows, CA	K*	12th	122	16
Hamilton Community Day	Hamilton Union High	600 Canal Street Hamilton, CA	11th	12th	2	1
Hamilton Elementary	Hamilton Union Elementary	277 Capay Street Hamilton City, CA	K*	8th	467	23
Hamilton Elementary Community	Hamilton Union Elementary	277 Capay Street Hamilton, CA	5th	6th	5	1
Hamilton Union High	Hamilton Union High	Hwy 32 and Canal Street Hamilton City, CA	9th	12th	309	13
Indian Valley Elementary	Stony Creek Joint Unified	5180 Lodoga Stonyford Road Stonyford, CA	5th	6th	15	1
Lake Elementary	Lake Elementary	4672 County Road N Orland, CA	K*	8th	124	6
Mill Street Elementary	Orland Joint Unified	102 Second Street Orland, CA	K*	3rd	515	29
Murdock Elementary	Willows Unified	655 W. French Street Willows, CA	K*	4th	676	36
North Valley High (Continuation)	Orland Joint Unified	220 Roosevelt Avenue Orland, CA	9th	12th	35	3
Orland Community Day	Orland Joint Unified	924 Second Street Orland, CA	8th	12th	7	1

Table 29-1
Glenn County Schools

School Name	District	School Address	Lowest Grade	Highest Grade	Total # of Students	Full-Time Staff
Orland Elementary Community Day	Orland Joint Unified	930 Second Street Orland, CA	2nd	6th	4	1
Orland High	Orland Joint Unified	101 Shasta Street Orland, CA	9th	12th	666	30
Plaza Elementary	Plaza Elementary	7322 County Road 24 Orland, CA	K*	8th	135	6
Price Intermediate	Orland Joint Unified	1212 Marin Street Orland, CA	6th	8th	499	23
Princeton Elementary	Princeton Joint Unified	428 Norman Road Princeton, CA	K*	6th	112	6
Princeton Elementary Community Day	Princeton Joint Unified	428 Norman Road Princeton, CA	6th	6th	2	1
Princeton High Community Day	Princeton Joint Unified	428 Norman Road Princeton, CA	9th	12th	4	1
Princeton Junior-Senior High	Princeton Joint Unified	473 State Street Princeton, CA	7th	12th	118	8
Special Education	Glenn County Office of Education	525 West Sycamore Willows, CA	K*	12th	133	21
Stony Creek Community Day	Stony Creek Joint Unified	300 Sanhedrin Road Elk Creek, CA	8th	8th	1	1
Stony Creek Elementary Community Day	Stony Creek Joint Unified	300 Sanhedrin Road Elk Creek, CA	1st	2nd	4	1
Willows Community Day	Willows Unified	823 W. Laurel Street Willows, CA	7th	12th	6	1
Willows Community High	Willows Unified	823 W. Laurel Street Willows, CA	10th	12th	31	4
Willows Elementary Community Day	Willows Unified	655 West French Street Willows, CA	2nd	4th	5	1
Willows High	Willows Unified	203 N. Murdock Avenue Willows, CA	9th	12th	497	17
Willows High Community Day	Willows Unified	823 West Laurel Street Willows, CA	9th	11th	7	1
Willows Intermediate	Willows Unified	1145 W. Cedar Street Willows, CA	5th	9th	490	21
Willows Intermediate Community Day	Willows Unified	1145 W. Cedar Street Willows, CA	8th	8th	4	1

*K = Kindergarten

Source: Ed Data. 2009.

Table 29-2
Glenn County School Bus Routes

School Name/Address	School District	School Bus Route
Bidwell Point High (Continuation) 300 Sanhedrin Road Elk Creek, CA	Stony Creek Joint Unified	County Road 36 and Hwy 162
Capay Joint Union Elementary 7504 Cutting Avenue Orland, CA	Capay Joint Union Elementary	Post Avenue, 4th Avenue/Road T, Clark Avenue, 5th Avenue/County Road S, 7th Avenue, Moller Avenue, 6th Avenue/Capay Road/County Road 202, Walch Avenue, 3rd Avenue/County Road V, 2nd Avenue/Road W, Cutting Avenue/Road 2, Cutler Avenue/County Road 4, Capay Avenue/County Road 7, Lindsay Avenue/County Road 8, 1st Avenue
Ella Barkley High 300 Hwy 32 Hamilton City, CA	Hamilton Union High	NA
Lake Elementary 4672 County Road N Orland, CA	Lake Elementary	County Road M, County Road 9/Wyo Avenue, County Road 10, County Road N, County Road 6, County Road 8, County Road O, County Road P, County Road PP, County Road 11, County Road QQ
Mill Street Elementary 102 Second Street Orland, CA	Orland Joint Unified	NA
Murdock Elementary 655 W. French Street Willows, CA	Willows Unified	Hwy 162, County Road O, County Road QQ, County Road 48, County Road S, County Road. 46, County Road 45, County Road N, County Road KK, County Road 68, County Road D, County Road 50. County Road 44, County Road 40, County Road V, County Road WW, County Road W, County Road X, County Road VV, County Road U, County Road T, County Road 34, County Road 36, Main Street in Artois, County Road 33, County Road F, Murdock Avenue
Plaza Elementary 7322 County Road 24 Orland, CA	Plaza Elementary	County Road S, County Road 30, County Road 25, County Road 24, County Road 20, County Road 19, County Road P, County Road U, County Road V
Princeton Junior-Senior High 473 State Street Princeton, CA	Princeton Joint Unified	County Road VV, Reservation Road Hwy 45, Dodge Road, Southam Road, Spencer Road, Hwy 162, County Road Y, County Road, 63, River Road, County Road 70, County Road Z, County Road 50, Killarney Street, Tehama Street, County Road 44, County Road 56, County Road 65, County Road 64, County Road 62, County Road WW, County Road 61

Note:
NA = Data Not Available

Source: Whitney, 2011; Scribner, 2011; Deitz, 2011; Smith, 2011; Nunes, 2011; Lopez, 2011; Willows Unified School District, 2011.

Colusa County

In 2009, there were 22 public schools within Colusa County, including six elementary/primary schools, three junior high/middle schools, four high schools, and nine other types of schools (including alternative, juvenile court, opportunity, continuation, and special education) (Ed-Data, 2009). Table 29-3 characterizes each public school in the County. Table 29-4 lists the school bus routes for each of the public school districts in the county.

Table 29-3
Colusa County Schools

School Name	District	School Address	Lowest Grade	Highest Grade	Total # of Students	Full-Time Staff
Arbuckle Alternative High (Continuation)	Pierce Joint Unified	966 Wildwood Road Arbuckle, CA	10th	12th	15	1
Arbuckle Elementary	Pierce Joint Unified	701 Hall Street Arbuckle, CA	K*	5th	562	29
Colusa Alternative High (Continuation)	Colusa Unified	817 Colusa Avenue Colusa, CA	10th	12th	26	1
Colusa Alternative Home	Colusa Unified	745 10th Street Colusa, CA.	K*	12th	85	3
Colusa County Community	Colusa County Office of Education	539 Oak Street Colusa, CA	7th	12th	11	1
Colusa County Opportunity	Colusa County Office of Education	345 Fifth Street, Suite DEF Colusa, CA	7th	12th	20	3
Colusa County Special Education	Colusa County Office of Education	946 Fremont Street Colusa, CA	K*	12th	86	21
Colusa High	Colusa Unified	901 Colusa Avenue Colusa, CA	9th	12th	343	19
Enid Prine High (Continuation)	Maxwell Unified	519 W. Oak Street Maxwell, CA	9th	12th	9	1
George T. Egling Middle	Colusa Unified	813 Webster Street Colusa, CA	4th	8th	473	21
Grand Island Elementary	Pierce Joint Unified	551 Leven Street Grimes, CA	K*	5th	77	3
James M. Burchfield Primary	Colusa Unified	400 Fremont Street Colusa, CA	K*	3rd	467	27
Juvenile Hall-Nielson	Colusa County Office of Education	1333 Fouts Road Colusa, CA	9th	12th	60	3
Lloyd G. Johnson Jr. High	Pierce Joint Unified	938 Wildwood Road Arbuckle, CA	6th	8th	272	10
Maxwell Elementary	Maxwell Unified	146 W. North Street Maxwell, CA	K*	8th	270	13
Maxwell High	Maxwell Unified	515 Oak Street Maxwell, CA	9th	12th	143	10
Mid Valley High	Williams Unified	1105 D Street Williams, CA	5th	12th	22	1
Pierce High	Pierce Joint Unified	960 Wildwood Road Arbuckle, CA	9th	12th	370	20
Williams High	Williams Unified	222 11th Street Williams, CA	9th	12th	354	21
Williams Junior	Williams Unified	222 11th Street Williams, CA	7th	8th	168	7
Williams Primary Elementary	Williams Unified	1404 E Street Williams, CA	K*	3rd	384	24
Williams Upper Elementary	Williams Unified	300 11th Street Williams, CA	4th	6th	290	12

*K = Kindergarten

Source: Ed Data. 2009.

Table 29-4
Colusa County School Bus Routes

School Name/Address	School District	School Bus Route
Arbuckle Alternative High (Continuation) 966 Wildwood Road Arbuckle, CA	Pierce Joint Unified	NA
Colusa Alternative Home 745 10th Street Colusa, CA	Colusa Unified	River Road, Dry Slough Road, Westcott Road/Walnut Tree Drive., Wilson Road, Ranch Road, Hwy 45, North Avenue, Neva Avenue, 14th Street, Clay Street, Wescott Road, County Club Drive, Woodhaven Drive, Florimond Drive, Fruitvale Avenue, Christie Lane
Enid Prine High (Continuation) 519 W. Oak Street Maxwell, CA	Maxwell Unified	Maxwell Sites Road, Sites Lodoga Road, Lodoga Stonyford Road, 3rd Street
Mid Valley High 1105 D Street Williams, CA	Williams Unified	NA

Note:
NA = Data Not Available

Source: Bailey, 2011; Azevedo, 2011.

Medical Care

Glenn County

The Glenn Medical Center, located in Willows, provides medical care services in Glenn County. It provides general medical and surgical care, emergency services, outpatient chiropractic services, outpatient women's health center, outpatient sleep center, and imaging services. It is a 15-bed facility. It employs a total of 102 full-time facility personnel including registered nurses (RNs), licensed practical nurses (LPNs), and licensed vocational nurses (LVNs) (McMillan, 2010).

Colusa County

The Colusa Regional Medical Center, located in Colusa, provides medical care services in Colusa County. It provides general medical and surgical care, general intensive care, obstetrics, emergency services, specialized inpatient and outpatient care, and imaging services (AHA, 2010b). It is a 48-bed facility (AHA, 2010b). It employs 32 full and part-time registered nurses, 11 full and part-time licensed practical nurses, and 143 total full- and part-time other facility personnel (Athenais, 2010).

Police Protection

Glenn County

The Glenn County Sheriff's Department is located in Willows, California. It has 77 employees, of which 28 are sworn peace officers (Leath, 2010). It provides law enforcement services within the unincorporated areas of the County in addition to providing backup and dispatch services for the Willows and Orland police departments. The Sheriff also shares law enforcement responsibilities within the National Forest with the Mendocino National Forest. The department administers the County Jail, Dispatch, functions as the County Coroner, patrols waterways, and acts as the Director of Emergency Services (Glenn County, 2008).

Law enforcement emergency services are also provided by the Orland Police Department, the Willows Police Department (USACOPS, 2010), and the California Highway Patrol.

Colusa County

The Colusa County Sheriff's Office is located in Colusa, California. It has 75 employees, of which 32 are sworn peace officers (Dixon, 2010). It is responsible for law enforcement in the unincorporated areas of Colusa County (i.e., the entire County except for the incorporated cities of Williams and Colusa). The Sheriff's Office has the following departments: Patrol, Investigations, Coroner, Animal Control, Drug Abuse Resistance Education (D.A.R.E.) Program, Narcotics Task Force, Special Operations and Response Team (S.O.A.R), Jail, Civil, Dispatch, Records, and Office of Prevention Services (Colusa County Sheriff's Office, 2009).

The Sheriff's Office also uses volunteer organizations to augment their paid staff for Search and Rescue, Sheriff's Mounted Posse, Volunteer Citizen Service Unit, Aero Squadron, and the Sheriff's Explorer Program (Colusa County Sheriff's Office, 2009).

Municipal police departments serve the cities of Williams and Colusa (USACOPS, 2010). The city police forces work closely with the County Sheriff's Office because many police matters cross jurisdictional boundaries. The cities and County participate jointly in search and rescue efforts. The U.S. Forest Service District Ranger provides services for the Mendocino National Forest. CDFG's Law Enforcement Division protects California's natural resources and provides public safety in the areas within its jurisdiction (CDFW, 2013). Wardens from the USFWS provide similar law enforcement services on federal National Wildlife Refuges. The California Highway Patrol patrols state roads in the County (Colusa County, 1989).

Fire Protection

Glenn County

Glenn County has 12 fire departments operating in 13 fire protection districts. All are independent of the California Department of Forestry and Fire Protection (CAL FIRE). The only paid personnel (five) in Glenn County are in the City of Willows. The fire departments are: Willows, Orland, Elk Creek, Artois, Kanawha, Butte City, Hamilton City, Capay, Bayliss, Glenn/Codora, and Ord Bend. CAL FIRE provides services from west of the electrical transmission lines located west of I-5 to the Mendocino National Forest (Norcalscan.org, 2009a).

Colusa County

Fire protection services in Colusa County are provided by rural districts, city fire departments, CAL FIRE, and the U.S. Forest Service. There are mutual aid agreements between most of the agencies to ensure that adequate personnel and equipment can be provided when a fire occurs (Colusa County, 1989).

The Colusa Rural Fire District consolidated with Grand Island Fire District to form the Sacramento River Fire District. The Sacramento River Fire District provides fire protection services to the rural portions of Colusa County. The Sacramento River Fire District, as well as the fire districts that serve the towns in Colusa County, are dispatched by the Colusa County Sheriff's Department (Norcalscan.org, 2009b).

29.2.3.2 Utilities

Water

Glenn County

The eastern portion of the County overlies the Sacramento Valley Groundwater Basin, which contains abundant supplies of good quality groundwater to depths of 800 feet. Groundwater is the primary source of domestic water supply in the County, and is also used for irrigation in areas where surface water is not available (Glenn County, 1993a). There are 17 municipal wells serving Willows, Hamilton City, and Orland. These wells range in depth from an average of 250 to 500 feet. There are 46 industrial wells in the County; they have an average depth of 250 feet (Messina, 2010).

The Sacramento River is the primary source of surface irrigation water in Glenn County; approximately 30 percent of the agricultural irrigation supply comes from groundwater. Water from the river is diverted into the Glenn-Colusa Irrigation District (GCID) and Tehama-Colusa (T-C) canals. Approximately 99 percent of the County's total water supply from the Sacramento River and the GCID Canal is directed to agricultural uses. The breakdown of surface water and groundwater deliveries by land use are listed in Table 29-5.

Table 29-5
Glenn County Water Supply Statistics

Land Use	Applied Water (acre-feet)			Percent Surface Water	Percent Groundwater
	Surface	Ground	Total		
Agricultural	657,300	247,900	905,200	73	27
Municipal/Industrial	0	9,200	9,200	0	100
Total	657,300	257,100	914,400	72	28

Source: DWR, 2011.

The County has approximately 34 municipal water supply systems that serve approximately 89 percent of the County's residents. Table 29-6 lists the active water systems within Glenn County.

Table 29-6
Active Water Systems in Glenn County

Water System Name	Population Served	Primary Water Source Type	Water System ID
Community Water Systems[a]			
Artois Community Service District	100	Groundwater	CA1100203
Black Butte Mobile Home Park	94	Groundwater	CA1100405
Black Butte Water Company	249	Groundwater	CA1100404
Cal-Water Service Company-Willows	6,680	Groundwater	CA1110003
Country Leisure Mobile Estates	40	Groundwater	CA1100413
Elk Creek Community Service District	300	Surface water	CA1100616
Orland Estates Mobile Home Park	150	Groundwater	Ca1100444
Orland Mobile Home Park	95	Groundwater	CA1100445
Shady Oaks Trailer Park	48	Groundwater	CA1100452
T&J Mobile Home Park	150	Groundwater	Ca1100436

Table 29-6
Active Water Systems in Glenn County

Water System Name	Population Served	Primary Water Source Type	Water System ID
Voyles Trailer Park	15	Groundwater	CA1100254
Willow Glenn Mobile Home Park	150	Groundwater	CA1100237
Non-Transient Non-Community Water Systems[b]			
Capay Joint Union Elementary School	172	Groundwater	CA1100527
Golden Pheasant Inn	25	Groundwater	CA1100159
Haigh Field Industrial Park	30	Groundwater	CA1105003
Johns Manville	200	Groundwater	CA1100232
Lake Elementary School	150	Groundwater	CA1100440
Plaza Elementary School	150	Groundwater	CA1100448
River Valley Christian School	60	Groundwater	CA1100749
Valley View Conservation Camp	130	Groundwater	CA1110800
Transient Non-Community Water Systems[c]			
Afton Store	25	Groundwater	CA1100709
Black Butte Lake, Orland Buttes Recreation Area, USACE	150	Groundwater	CA1100642
Caltrans-Willows Reststop-Northbound	7,500	Groundwater	CA1100257
Caltrans-Willows Reststop-Southbound	7,500	Groundwater	CA1100258
Glenn Golf & Country Club	50	Groundwater	CA1100221
Irvine Finch River Access	200	Groundwater	CA1110300
Old Orchard RV Park	25	Groundwater	CA1100460
Orland Livestock Commission Yard, Inc.	100	Groundwater	CA1100443
River Glenn	25	Groundwater	CA1100208
Sacramento National Wildlife Refuge	500	Groundwater	CA1100250
South Willows Industrial Park	60	Groundwater	CA1105001
The Parkway RV Resort	25	Groundwater	CA1100439
Thunderhill Raceway Park – Sports Car Club of America, San Francisco Region	750	Groundwater	CA1100229
Uncle Chong's Chinese Restaurant	25	Groundwater	CA1100406

[a]Community Water Systems: Water systems that serve the same people year-round (e.g., in homes or businesses).

[b]Non-Transient Non-Community Water Systems: Water systems that serve the same people, but not year-round (e.g., schools that have their own water system).

[c]Transient Non-Community Water Systems: Water systems that do not consistently serve the same people (e.g., rest stops campgrounds, gas stations).

Note:

RV = Recreation Vehicle

Source: USEPA, 2010a.

Colusa County

Municipal and industrial water needs in Colusa County are primarily met by groundwater supply from an estimated 1,936 wells (DWR, no date). Supply is supplemented with approximately 27 percent surface water. Domestic water systems in Colusa County are supplied with groundwater from wells generally

100 to 500 feet deep. The County's water use is almost entirely agricultural. The breakdown of surface water and groundwater deliveries by land use are listed in Table 29-7.

Table 29-7
Colusa County Water Supply Statistics

Land Use	Applied Water (acre-feet)			Percent Surface Water	Percent Groundwater
	Surface	Ground	Total		
Agricultural	891,200	158,000	1,049,200	85	15
Municipal/Industrial	200	6,100	6,300	3	97
Total	891,400	164,100	1,055,500	84	16

Source: DWR, 2011.

The County has approximately 29 municipal water supply systems (USEPA, 2010b). Water is supplied to Colusa County from the T-C Canal, the GCID Canal, the Colusa Basin Drain, the Sacramento River, and groundwater. The T-C Canal provides irrigation water to lands west of the cities of Maxwell, Williams, and Arbuckle. Agricultural water districts in Colusa County include irrigation districts, water districts, County districts, reclamation districts, levee districts, drainage districts, mutual water companies, and national wildlife refuges (Colusa County, 1989). Table 29-8 lists the active water systems within Colusa County.

Table 29-8
Active Water Systems in Colusa County

Water System Name	Population Served	Primary Water Source Type	Water System ID
Community Water Systems[a]			
Arbuckle Public Utility District	2,100	Groundwater	CA0610001
Colusa County Service Area #1-Century Ranch	120	Surface water	CA0600012
Colusa County Service Area #2-Stonyford	200	Groundwater	CA0600005
Colusa County Water District #1-Grimes	500	Groundwater	CA0600008
Maxwell Public Utility District	850	Groundwater	CA0610003
Princeton Water District	356	Groundwater	CA0600013
Del Oro Water Company – Walnut Ranch	182	Groundwater	CA0600011
Non-Transient Non-Community Water Systems[b]			
ADM Rice, Inc.	30	Groundwater	CA0605004
SK Foods - Colusa Canning	31	Groundwater	CA0600061
Colusa Industrial Properties	350	Groundwater	CA0600065
Fouts Springs Youth Facility	120	Groundwater	CA0600041
Morning Star Packing Company-Williams	230	Groundwater	CA0605002
Sun Valley Rice Company	90	Groundwater	CA0605007
Transient Non-Community Water Systems[c]			
Arbuckle Golf Club	120	Groundwater	CA0600042
Caltrans-Maxwell Reststops	15,000	Groundwater	CA0600050
Colusa Landing	25	Groundwater	CA0600009
Grimes Boat and Landing	50	Groundwater	CA0600003
Kingdom Hall of Jehovah's Witness-Williams	100	Groundwater	CA0605005

Table 29-8
Active Water Systems in Colusa County

Water System Name	Population Served	Primary Water Source Type	Water System ID
Menf-Letts Lake Campground	100	Groundwater	CA0600056
Richmond Hunting Club-Arbuckle	63	Groundwater	CA0605009
Richmond Hunting Club-Maxwell	95	Groundwater	CA0605006
River Vista Farms	25	Groundwater	CA0600004
Squaw Creek Water System	25	Groundwater	CA0600072
Terhel Farms Trailer Park 01	25	Groundwater	CA0600027
Ward's Boat Landing	25	Groundwater	CA0600001
Wilbur Hot Springs	65	Groundwater	CA0600016
Wilderness Unlimited	25	Groundwater	CA0600032
Willow Creek Mutual Water Company-Clarkville	110	Groundwater	CA0600007
Willow Creek Mutual Water Company-Lambertville	30	Groundwater	CA0600033

[a]Community Water Systems: Water systems that serve the same people year-round (e.g., in homes or businesses).

[b]Non-Transient Non-Community Water Systems: Water systems that serve the same people, but not year-round (e.g., schools that have their own water system).

[c]Transient Non-Community Water Systems: Water systems that do not consistently serve the same people (e.g., rest stops campgrounds, gas stations).

Source: USEPA, 2010b.

Wastewater

Glenn County

In Glenn County, wastewater is treated and returned to the environment using primarily on-site disposal and centralized disposal. The areas served by on-site systems are generally rural or agricultural. The centralized disposal systems are comprised of three wastewater treatment facilities and collection systems serving most of the urbanized portions of Glenn County: Willows, Orland, and Hamilton City (Glenn County, 1993b). All other waste disposal occurs in individual septic systems, with the exception of Caltrans' I-5 rest stop, Glenn Milk Producers, and Holly Sugar, which use industrial wastewater treatment ponds.

Colusa County

In Colusa County, wastewater is treated and returned to the environment using primarily on-site disposal and centralized disposal. The areas served by onsite systems are generally rural or agricultural. Although most onsite systems serve an individual dwelling or commercial establishment, some serve groups of homes or businesses. The onsite systems consist of a septic tank and a leach field (Colusa County, 1989).

Five communities are served by centralized systems: Arbuckle, Colusa, Maxwell, Princeton, and Williams. Community systems consist of a network of collection lines, a treatment facility, and a disposal system (typically evaporation ponds that are discharged to a stream or drainage channel). The Arbuckle Public Utility District provides sewer service to Arbuckle residents using a system of clay pipes that convey wastewater to a treatment plant north of town. The City of Colusa operates a wastewater treatment plant and evaporation pond system in an agricultural area approximately 1.5 miles southwest of downtown. Maxwell's wastewater treatment plant is located approximately one mile south of town; it has a collection system of concrete, clay, and PVC pipes. Princeton also has a wastewater treatment system. The City of Williams operates a wastewater treatment plant on a 30-acre site north of town (Colusa County, 1989).

Solid Waste

Glenn County

Glenn County has one landfill, located near Artois. The permitted site area is 356.4 acres and the permitted disposal area is 83 acres. It is permitted to receive 200 tons of waste per day. The landfill has a design capacity of 2,400,000 cubic yards (cy) (CIWMB, 2010); total estimated capacity remaining as of June 8, 2010 was 348,223 cy (CIWMB, 2011a). It is a Class III facility, with an expected closure date of 2013. Glenn County has no plans to build a new landfill. A decision will be made by the County in the future regarding the selected method to manage waste disposal after its landfill closes. Glenn County is considering several options to constructing a landfill, including building a transfer station to transfer collected waste to landfills in other counties, using waste management companies that own or operate landfills in other counties, and adopting treatment technologies as an alternative to landfilling (Linhart, pers. comm., 2011).

The Glenn County Public Works Department owns and operates the landfill. Collection services are provided by Waste Management of California, Inc. Self-haul loads are also accepted. The landfill only accepts “in-County” loads (Varga, pers. comm. 2004).

In addition, in Glenn County, other active waste handling facilities include the Valley Gold Compost (composting operation for manure and green materials) (CIWMB, 2011b); Compost Solutions, Inc. (a composting operation that handles agricultural materials, green materials, and manure) (CIWMB, 2011c), and Caltrans Maintenance (a transfer and processing operation that handles metals, mixed municipal, tires, and wood waste) (CIWMB, 2011d).

Colusa County

There are four types of solid waste generated in Colusa County: residential, commercial, industrial, and natural resource byproducts[1] (Colusa County, 1989). Colusa County owns and operates the Stonyford Disposal Site, located on Lodoga Stonyford Road in Stonyford. The landfill is a 47-acre Class III facility that is permitted for up to 10 tons per day of non-hazardous waste. The mix of waste it receives includes agricultural, construction/demolition, mixed municipal, and tires. The landfill’s design capacity is 149,219 cy, and the total estimated capacity used was 93,536 cy with the remaining estimated capacity of 55,683 cy as of April 30, 2001 (CIWMB, 2011e). As of 2001, the landfill’s life expectancy was 63 years (closure date January 1, 2064). The landfill accepts only “in-County” loads.

Other active waste handling facilities in Colusa County include the Maxwell Transfer Station (transfer/processing of agricultural, construction/demolition, mixed municipal, and tire waste) (CIWMB, 2011f) and Premier Mushrooms (a composting operation for agricultural waste and manure) (CIWMB, 2011g). In addition, a solid waste disposal facility is planned to be located south of the City of Colusa (CIWMB, 2011h).

[1] Natural resource byproducts include rice stubble and straw, manure, gas well mud, cannery waste, and waste from prune dehydrators.

Two facilities outside of Colusa County provide additional landfill capacity. Approximately 55 tons per year of waste from the City of Colusa are shipped by compactor truck to Norcal Waste Systems Ostrom Road Landfill, Inc., located in Wheatland in Yuba County. In addition, the Maxwell Transfer Station sends 14,500 tons per year to the Anderson Landfill in Shasta County.

The Norcal Waste Systems Ostrom Landfill, Inc. is a 261-acre Class II facility, and can accept up to 3,000 tons of municipal solid waste per day. The facility has an expected closure date of December 31, 2066 (CIWMB, 2011i), with a total design capacity of 41,822,300 cy (CIWMB, 2002), and remaining capacity as of June 1, 2007 of 39,223,000 cy (CIWMB, 2011i).

The Anderson Landfill is a 246-acre Class III site with a design capacity of 16,353,000 cy (CIWMB, 2008). It has an expected closure date of January 1, 2055, and a total permitted capacity of 1,850 tons per day (CIWMB, 2011j). It is operated by Waste Management of California, Inc. Waste collection in Williams and in the unincorporated areas of the County is performed by Waste Management, Inc. The City of Colusa provides collection service in its jurisdiction (Colusa County, 2004).

Natural Gas

Glenn County

Natural gas is provided by PG&E in the more populated areas of Glenn County, and several propane companies serve the outlying areas of the County (Glenn County, 2010).

Colusa County

Natural Gas is provided by PG&E in the more populous areas of the County, and several propane companies serve the outlying areas in Colusa County (Colusa County, 2010). There is gas service to Maxwell, but none to the town of Sites or the proposed Sites Reservoir area. To the east of Funks Reservoir, aligned in a north/south orientation, PG&E operates two high-pressure arterial gas transmission lines that originate in Canada and serve most of northern and central California. These two lines are 42 and 36 inches in diameter, and have a right-of-way of 100 feet.

Electricity

Glenn County

Electricity is provided to the populated areas of Glenn County by PG&E (Glenn County, 2010).

Colusa County

PG&E provides electric service to Colusa County. Through the Project area in Colusa County, PG&E operates 12-kV distribution lines on rights-of-way that range from 10 to 30 feet wide. These lines serve the town of Sites and vicinity. Lines exist along the Maxwell Sites Road, and feed south in the general direction of Leesville via Huffmaster Road. In addition, the Western Area Power Administration operates two high-voltage transmission lines, aligned north/south and passing just east of Funks Reservoir. The 500-kV line occupies a 125-foot-wide right-of-way and is routed from the Olinda Substation to the Tracy Substation. The 230-kV line occupies a 160-foot-wide right-of-way, and is routed from Keswick to Elverta.

Telephone

Glenn County

In Glenn County, telephone service is provided by AT&T and Comcast (Glenn County, 2010).

Colusa County

In Colusa County, telephone service is provided by AT&T, Comcast, and Frontier Communications Solutions (Colusa County, 2010).

In the Project vicinity, telephone service is provided by Frontier Communications via buried lines in the town of Sites and in the valley. On Maxwell Sites Road, from the town of Maxwell, there is buried cable in the County road easement west to the town of Sites. In the town of Sites, there is a combination of buried and overhead cable on power poles serving the existing homes. West toward Lodoga there is a buried telephone cable in the County road for approximately one mile, and then on to private property for approximately one mile. Facilities also are located south on Huffmaster Road within the County right-of-way for 6.5 miles. Taps serve local ranches and a radio antenna site on PG&E poles.

Cable

Glenn County

Cable service in Glenn County is provided both individually and in tandem with telephone service by Comcast Cable and AT&T. Cable is available in most urban and urban-rural areas (Glenn County, 2010).

Colusa County

In Colusa County, cable TV service is provided individually by Comcast Cable, and is also provided in tandem with telephone service by Comcast Cable. Cable is available in most urban and urban-rural areas, but is not provided to the town of Sites, or nearby. Internet service is provided by a variety of DSL and cable internet service providers, including HughesNet Services, People PC Online, and in tandem with telephone service by Comcast and Frontier Communications Solutions (Colusa County, 2010).

29.3 Environmental Impacts/Environmental Consequences

29.3.1 Regulatory Setting

Public services and utilities are regulated at the federal, State, and local levels. Primary management occurs by local governments or local or regional special districts. Federal regulatory agency involvement is typically limited to review of a provider’s operation related to a specific area, such as the environment, public safety, waterways, and fisheries. Provided below is a list of the applicable public service/utility regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

29.1.1.1 Federal Plans, Policies, and Regulations

- Americans with Disabilities Act of 1990
- Critical Infrastructure Information Act of 2002
- National Fire Protection Association 1710 Standard

29.1.1.2 State Plans, Policies, and Regulations

- Health and Safety Code Sections 13000 et seq.
- Health and Safety Code Sections 13145 and 13146
- Health and Safety Code, Section 13801 et seq.
- California Government Education Code Section 17620

29.1.1.3 Regional and Local Plans, Policies, and Regulations

- Glenn County General Plan
- Colusa County General Plan

29.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for public services and utilities:

Would the Project:

- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:
  - Fire protection?
  - Police protection?
  - Schools?
  - Parks?
  - Other public facilities?
- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?
- Have sufficient water supplies available to serve the Project from existing entitlements and resources, or are new or expanded entitlements needed?
- Result in a determination by the wastewater treatment provider which serves or may serve the Project that it has adequate capacity to serve the Project's projected demand in addition to the provider's existing commitments?
- Be served by a landfill with sufficient permitted capacity to accommodate the Project's solid waste disposal needs?
- Comply with federal, State, and local statutes and regulations related to solid waste?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A substantial adverse physical impact associated with the provision of new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for the following public services: fire protection, police protection, schools, parks, and/or other public facilities, and disruptions to local or regional utility services.
-
- A decline in property tax or fee revenues that would lead to a substantial decrease in public services
- Exceed the wastewater treatment requirements of the applicable Regional Water Quality Control Board.
- The need for expansion of existing wastewater treatment, water treatment, stormwater, and/or landfill facilities.
- Require new or expanded water supply entitlements and resources.
- Non-compliance with federal, State, and local statutes and regulations related to solid waste.

29.3.3 Impact Assessment Assumptions and Methodology

29.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to public services and utilities:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.

- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.

29.3.3.2 Methodology

The evaluation of potential Project-related construction, operation, and maintenance impacts was performed by comparing the facilities and services that were identified in the Environmental Setting/Affected Environment discussion with proposed Project construction, operation, and maintenance activities to assess the potential for service disruptions.

The methodology used to calculate the annual Recreation Visitor Days (RVDs[2]) and changes in property taxes per year for Alternatives A, B, and C are described in Chapter 22 Socioeconomics.

29.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

29.3.5 Impacts Associated with the No Project/No Action Alternative

29.3.5.1 Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay,) Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential to result in impacts to local and regional public services and utilities has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on public services and utilities, when compared to Existing Conditions.

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[2] An RVD is defined as a recreation visit by one person for part or all of one day.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to increase the demand for public services and utilities, as well as affect the existing levels of services that are currently provided. Public services and utilities are managed at the local level (e.g., cities and counties) in accordance with those agencies' regulations. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions

In addition, projects considered within the No Project/No Action Alternative are not located within the Primary Study Area, and therefore, **would not have a substantial adverse effect** on public services and utilities within that study area, when compared to Existing Conditions. Similarly, the Project would not be constructed if this alternative is implemented, so no temporary or permanent disruptions of or effects on public services and utilities would occur. Therefore, **there would not be a substantial adverse effect** on public services and utilities in any of the three study areas, when compared to Existing Conditions.

Impact Services-2: A Decline in Property Tax or Fee Revenues that Would Lead to a Substantial Decrease in Public Services

If the No Project/No Action Alternative is implemented, the fiscal condition of local governments in the Extended, Secondary and Primary study areas is expected to be similar to that described for Existing Conditions. Growth in population would be accompanied by a corresponding growth in tax revenues and government budgets. Therefore, **there would not be a substantial adverse effect** to public services as a result of property taxes or fee revenues, when compared to Existing Conditions.

Impact Services-3: Exceed the Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board

Refer to the **Impact Services-1** discussion. That discussion also applies to the exceedance of wastewater treatment requirements.

Impact Services-4: The Need for Expansion of Existing Wastewater Treatment, Water Treatment, Stormwater, and/or Landfill Facilities

Refer to the **Impact Services-1** discussion. That discussion also applies to the need for expansion of existing wastewater treatment, water treatment, stormwater, and/or landfill facilities.

Impact Services-5: Require New or Expanded Water Supply Entitlements and Resources

Refer to the **Impact Services-1** discussion. That discussion also applies to the need for new or expanded water supply entitlements and resources.

Impact Services-6: Non-Compliance with Federal, State, and Local Statutes and Regulations Related to Solid Waste

Refer to the **Impact Services-1** discussion. That discussion also applies to non-compliance with federal, State, and local statutes and regulations related to solid waste.

29.3.6 Impacts Associated with Alternative A

29.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, and San Luis Reservoir

Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services

There would be no direct Project-related construction or maintenance occurring within the CVP and SWP service areas of the Extended Study Area. Therefore, there would be no disruptions to utility services in the Extended Study Area, and there would not be a substantial adverse physical impact from new or physically altered governmental facilities (nor would Alternative A create demand for new or physically altered governmental facilities), resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation of San Luis Reservoir would be altered to accommodate Project operation, which would result in more frequent and larger surface water elevation fluctuations at the reservoir than currently occur there. In addition, Project operation would result in increased water supply reliability to agricultural, municipal, and industrial users, and an alternate water supply source for the wildlife refuges in the Extended Study Area. These operations would not be expected to change the number of people living within the Extended Study Area (i.e., Alternative A would not induce population growth), and consequently are not expected to change the demand for public services or require new or physically altered governmental facilities. In addition, changes in reservoir operation would not be expected to disrupt utility services. Therefore, there would be **no impact** on public services and utilities from operations in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative.

The increased SWP/CVP exports associated with implementation of Alternative A could potentially result in increased storage at some of the export service area reservoirs within the Extended Study Area. Small increases in storage at these reservoirs could result in slightly increased recreation use at these reservoirs. These effects on recreation use in the Extended Study Area would be negligible and would not disrupt utilities or result in increased demand for public services that would require new or physically altered governmental facilities, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-2: A Decline in Property Tax or Fee Revenues that Would Lead to a Substantial Decrease in Public Services

Project construction, operation, and maintenance activities would affect the regional economic condition (including property taxes and other revenues) of the Extended Study Area through direct Project construction and maintenance expenditures in Glenn and Colusa counties, operation expenditures occurring throughout the Extended Study Area where SWP and CVP facilities are re-operated as a result of the Project, and where Project facilities would be operated. In addition, the removal of agricultural land from production at Project facility sites in Glenn and Colusa counties would affect revenues. The magnitude of the economic impacts and their associated effects on public services would be minor when compared to the regional economy of the Extended Study Area. Providing increased water supply reliability to agricultural, municipal, and industrial users, and an alternate water supply source for the wildlife refuges in the Extended Study Area would have no effect on property taxes or other revenues. Therefore, this would be **a less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-3: Exceed the Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board

Because no direct Project-related construction and/or maintenance work within the CVP and SWP service areas of the Extended Study Area is expected, there would be **no impact** on wastewater treatment agencies' abilities to meet wastewater treatment requirements.

The predicted changes in San Luis Reservoir operation, the increased reliability of water supply, and an alternate water supply for wildlife refuges, from implementing Alternative A, are not expected to affect the amount of wastewater that is currently generated or treated, nor would they affect the wastewater treatment requirements in the Extended Study Area. They would also not affect the abilities of wastewater treatment agencies in the Extended Study Area to meet existing wastewater treatment requirements because existing population growth rates throughout the Extended Study Area are not expected to change as a result of implementing Alternative A. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The potential increased recreation use at the export service area reservoirs within the Extended Study Area (refer to **Impact Services-1**) would be negligible and would not affect the amount of wastewater that is currently generated or treated, nor would it affect the wastewater treatment requirements in the Extended Study Area. Therefore, there would be **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-4: The Need for Expansion of Existing Wastewater Treatment, Water Treatment, Stormwater, and/or Landfill Facilities

Because no direct Project-related construction and/or maintenance work within the CVP and SWP service areas of the Extended Study Area is expected, there would be **no impact** to utilities that manage wastewater treatment facilities, water treatment facilities, stormwater systems, and/or landfills, when compared to Existing Conditions and the No Project/No Action Alternative.

The predicted changes in San Luis Reservoir operation are not expected to change the public's recreation use at the reservoir, resulting in **no impact** to existing wastewater treatment, water treatment, stormwater, and/or landfill facilities in that area. Similarly, the increased reliability of agricultural and M&I water supply from implementing Alternative A is expected to result in **no impact** to wastewater treatment, water treatment, stormwater, or landfill facilities in the Extended Study Area, when compared to Existing Conditions and the No Project/No Action Alternative, because existing population growth rates throughout the Extended Study Area are not expected to change as a result of implementing Alternative A.

Providing an alternate source of water supply to the wildlife refuges, as part of operation of Alternative A, is not relevant to existing wastewater treatment or landfill facility operations, and would, therefore, have

no impact on wastewater treatment or landfill facilities operations, when compared to Existing Conditions and the No Project/No Action Alternative.

In addition, the water deliveries to SWP and CVP contractors as a result of Alternative A operation would be within the historical range of existing operations and no additional construction of water conveyance or treatment facilities would be needed, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Most of the water contractors within the Extended Study Area have alternative water supplies (e.g., local surface water or groundwater). In the future, they may add recycling, conservation, and other improvements to their water systems to accommodate planned population growth and maintain reliability in their systems. Adding a surface water supply option (such as from Alternative A) may reduce the need for these additional alternative water supply options. Thus, increased water supply reliability may result in a reduction in the future need for construction and operation of additional water treatment and distribution facilities. Therefore, there would be a **less-than-significant impact** on the need to expand existing wastewater treatment, water treatment, stormwater, or landfill facilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-5: Require New or Expanded Water Supply Entitlements and Resources

When compared to Existing Conditions and the No Project/No Action Alternative, Project operation would result in a **potentially beneficial impact** by possibly reducing reliance on groundwater in the Extended Study Area in locations where water is provided by the CVP or SWP. With increased water supply reliability to CVP and SWP water contractors, shortages in deliveries may decrease if Alternative A is implemented.

In addition, the expected changes in San Luis Reservoir operation from implementing Alternative A, as well as providing an alternate water supply source for the wildlife refuges in the Extended Study Area, would not cause total deliveries to any contract to exceed existing contract quantities. San Luis Reservoir would be operated such that there would be more frequent and larger water level fluctuations than currently occurs as a result of the increases in deliveries associated with these contracts. Therefore, there would be **no impact** to water supply entitlements and resources, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-6: Non-Compliance with Federal, State, and Local Statutes and Regulations Related to Solid Waste

Because no direct Project construction, operation, and/or maintenance work within the CVP and SWP service areas of the Extended Study Area would occur with implementation of Alternative A, complying with federal, State, and local statutes and regulations pertaining to solid waste in the Extended Study Area would not be an issue. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The expected changes in San Luis Reservoir operation, the increased reliability of water supply from implementing Alternative A, and providing an alternate source of wildlife refuge water supply in the Extended Study Area are not expected to affect solid waste facilities or transporters located in or serving the Extended Study Area. In addition, they would not restrict the facilities or transporters from complying with federal, State, and local solid waste regulations. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

29.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Keswick Reservoir, Sacramento River, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay); Feather River; Sutter Bypass; Yolo Bypass; Folsom Lake; Lake Natoma; American River; Sacramento-San Joaquin Delta; Suisun Bay; San Pablo Bay; and San Francisco Bay

Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services

No Project construction would occur within the Secondary Study Area at any of the above-listed facilities or areas, so there would not be a disruption to utility services or a substantial adverse physical impact from new or physically altered governmental facilities (nor would Alternative A create demand for new or physically altered governmental facilities), resulting in **no impact** on public services or utilities at or near those locations with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of Alternative A would result in operational changes to the CVP and SWP facilities (e.g., increased storage at reservoirs and altered flow regimes on rivers and in the bypasses) within the Secondary Study Area. These operational changes are not expected to disrupt local or regional utility providers, resulting in **no impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Operational modeling for Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative, indicates that Alternative A would provide improved storage conditions in Trinity Lake, Shasta Lake, and other recreational areas in the Secondary Study Area. Improved storage conditions can result in increased recreation use, but these operational changes are not expected to increase recreation use to a level that would require new or physically altered governmental facilities in the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Altered flows and temperatures can result in an increased need for emergency response services to recreationists. However, the changes to the flow regime of the streams included in the Secondary Study Area would fall within the historic range of flows, and would not be expected to result in an increased need for emergency response at a level that would require new or physically altered governmental facilities. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-2: A Decline in Property Tax or Fee Revenues that Would Lead to a Substantial Decrease in Public Services

No Project construction would occur within the Secondary Study Area at any of the above-listed facilities or areas, so no change in property taxes or other revenues are expected that would affect public services. Therefore, **no impact** on public services is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Integrated Project operation with existing SWP and CVP facilities may affect the O&M costs of public services and utilities for those facilities within the Secondary Study Area and could affect regional economic conditions. However, the magnitude of the economic impacts and their associated effects on public services would be minor. Therefore, this would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-3: Exceed the Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board

No Project construction would occur within the Secondary Study Area at any of the above-listed facilities or areas, so **no impact** on wastewater is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

Alternative A would provide improved storage to Trinity Lake, Shasta Lake, and other recreational areas in the Secondary Study Area; however, the improved storage conditions are not expected to increase recreation use to a level that would affect the amount of wastewater that is currently generated or treated, nor would it affect the wastewater treatment requirements in the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-4: The Need for Expansion of Existing Wastewater Treatment, Water Treatment, Stormwater, and/or Landfill Facilities

No Project construction would occur within the Secondary Study Area at any of the above-listed facilities or areas, so **no impact** on wastewater treatment, water treatment, stormwater, or landfill facilities is expected, when compared to Existing Conditions and the No Project/No Action Alternative.

The improved storage conditions at Secondary Study Area facilities that would be provided by Alternative A would not increase recreation use at the above-listed facilities to a level that would affect the amount of wastewater or refuse that is currently generated or treated/disposed of in the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Increased water supply reliability could potentially result in a reduction in the future need for construction and operation of additional water treatment and distribution facilities. There could be a shift from more costly options (including high cost recycling and desalination) to the less expensive option of maintaining and operating the existing water treatment and conveyance systems that are already in use. Therefore, there would be **a potentially beneficial impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-5: Require New or Expanded Water Supply Entitlements and Resources

Implementation of Alternative A would result in operational changes to the CVP and SWP facilities (e.g., increased storage at reservoirs and altered flow regimes on rivers and in the bypasses) within the

Secondary Study Area. These operational changes would not require new or expanded water supply entitlements/resources, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-6: Non-Compliance with Federal, State, and Local Statutes and Regulations Related to Solid Waste

Because no direct Project construction and/or maintenance work at the above-listed facilities in the Secondary Study Area would occur with implementation of Alternative A, complying with federal, State, and local statutes and regulations pertaining to solid waste in the Secondary Study Area would not be an issue. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative. Increased storage at CVP and SWP reservoirs and altered flow regimes on rivers and in the bypasses in the Secondary Study Area is not relevant to solid waste regulations, so there would be **no impact** on compliance with such regulations, when compared to Existing Conditions and the No Project/No Action Alternative.

Pump Installation at the Red Bluff Pumping Plant

Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services

The only direct Project-related construction that would occur in the Secondary Study Area is the installation of a pump into an existing bay at the Red Bluff Pumping Plant (RBPP). This pump would be installed at an existing plant, requiring few pieces of equipment, limited construction activities, and a short construction period. Therefore, the pump's installation would not disrupt local or regional utility services and would not result in a substantial adverse physical impact from new or physically altered governmental facilities (nor would Alternative A create demand for new or physically altered governmental facilities), resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative. The pump's operation, as part of the larger pumping plant's operation, would also result in **no impact** on public services and utilities.

The only direct Project-related maintenance activity that would occur with implementation of Alternative A is the maintenance of the pump and the continued removal of sediment from the existing T-C and GCID canal intakes as part of the pumping plant's maintenance activities. It is expected that contractors would transport and dispose of the sediment in accordance with all federal, State, and local regulations, in compliance with their contract specifications. These maintenance activities would not disrupt local or regional utility services and would not result in a substantial adverse physical impact from new or physically altered governmental facilities (nor would Alternative A create demand for new or physically altered governmental facilities), resulting in **no impact** on local public services and local/regional utilities, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-2: A Decline in Property Tax or Fee Revenues that Would Lead to a Substantial Decrease in Public Services

The installation of the pump at the existing RBPP would have minimal, if any, effects on property taxes and other revenues within the Secondary Study Area. In addition, the pump's operation and maintenance, and continued sediment removal at the canal intakes, as part of the existing pumping plant's operation and maintenance, would not affect property taxes or revenues within the Secondary Study Area. Therefore, there would be **no impact** on public services, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-3: Exceed the Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board

The pump's installation, operation, and maintenance, and continued sediment removal at the canal intakes, would have no effect on the wastewater treatment requirements for the Secondary Study Area. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-4: The Need for Expansion of Existing Wastewater Treatment, Water Treatment, Stormwater, and/or Landfill Facilities

The pump would be installed at an existing pumping plant, requiring a limited number of pieces of equipment, limited construction activities, and short construction duration. Its installation, operation, and maintenance, and continued sediment removal at the canal intakes, would not require that any utility facilities be expanded. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-5: Require New or Expanded Water Supply Entitlements and Resources

The pump's installation, operation, and maintenance, and continued sediment removal at the canal intakes, would not require new or expanded water supply entitlements and resources. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-6: Non-Compliance with Federal, State, and Local Statutes and Regulations Related to Solid Waste

Complying with solid waste regulations is not related to the installation of a pump into an existing pumping plant, the maintenance of the pump and the two canal intakes, or the pump's operation. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

29.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Potential impacts to public services and utilities from construction, operation, and maintenance of the Project facilities are discussed below.

All Primary Study Area Project Facilities

Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services

Schools, Police Protection, Fire Protection, and/or Other Public Facilities

During construction of the Alternative A Sites Reservoir Inundation Area and Sites Dam, the existing western portion of Maxwell Sites Road and the portion of Sites Lodoga Road that currently crosses Antelope Valley (needed to develop Sites Reservoir) would be demolished and removed. However, the South Bridge would be constructed and operating before the portions of these roads were demolished and removed. The new route that would include the South Bridge would be approximately two miles longer than the existing route. The slightly longer route would have a minimal effect on bus services provided by the Maxwell Unified School District and on emergency service response times and therefore would not require new or physically altered government facilities, resulting in **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Access to the west side of the proposed Sites Reservoir (including to the town of Lodoga) from the east side during construction of the South Bridge would be via the existing Maxwell Sites and Sites Lodoga roads (i.e., no change from the existing route). Access to the southern portion of Sites Reservoir during the construction of South Bridge would be via the existing Huffmaster Road (also no change from the existing route). Sulphur Gap Road would be constructed prior to the demolition and removal of the portion of Huffmaster Road that crosses the proposed Sites Reservoir footprint to maintain access to residences near the southern portion of the reservoir footprint and to the town of Leesville. Scheduling the construction of the South Bridge and Sulphur Gap Road early in the Project construction period, thus maintaining access within and across Antelope Valley, would allow emergency service providers to maintain acceptable response times during Project construction. Consequently, there would be no need for new or physically altered governmental facilities to maintain response times, resulting in **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

During Project construction, traffic levels on local roads leading to all of the Project facilities would increase. This increased traffic could have an adverse effect on emergency service providers' ability to maintain acceptable response times during Project construction. However, construction traffic levels would not be expected disrupt emergency service response to the point that would require the construction of new facilities to maintain adequate response times, resulting in **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Construction of all of the Project facilities associated with implementation of Alternative A would require an estimated average workforce of 95 employees for the 10-year construction period. This temporary addition of people to the workforce is not expected to result in a substantial increase in demand for new or extended public services, or require additional schools. Similarly, Project operation and maintenance would require few permanent employees (35 employees), which would not be expected to result in a substantial increase in demand for public services or schools and therefore would not require new or altered governmental facilities. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During construction, operation, and maintenance of Alternative A, adequate emergency access would be maintained to individual landowner properties located along routes to proposed Project facilities that are outside of the Sites Reservoir Inundation Area. Therefore, there would not be a need for new or altered government facilities, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of all of the Project facilities would result in the use of relatively few vehicles. This slight increase would not be expected to generate traffic levels that would interfere with emergency services. Consequently, there would not be a need for new or altered governmental facilities, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Because Sites Reservoir is expected to generate 360,975 RVDs per year during its operation, traffic is expected to increase on Maxwell Sites Road and County Roads 68, 69, and D during Project operation (primarily Fridays through Sundays during the recreation season) (refer to Chapter 26 Navigation, Transportation, and Traffic). This increase in traffic levels could adversely affect emergency response times. However, traffic levels would not be expected to disrupt emergency service response to the point that would require the construction of new facilities to maintain adequate response times, resulting in **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

The increased number of visitors to the area due to the development and presence of Sites Reservoir and the recreation opportunities that would be offered would likely increase the demand for fire protection, police protection, and emergency medical services. If demand were to increase substantially, existing government facilities may need to be expanded or new facilities may need to be constructed in order to maintain acceptable service ratios. However, the increased demand would be seasonal, and the emergency and law enforcement response to Sites Reservoir and associated Project facilities would be provided by numerous agencies and facilities. Depending on the location and type of service call, primary responsibility for response could fall under the jurisdiction of the Glenn or Colusa county sheriff's departments, municipal police departments, California Highway Patrol, U.S. Forest Service, CDFG, State Parks, CAL FIRE, city fire departments, volunteer fire departments or fire protection districts, or a combination thereof through mutual aid agreements. Given that the seasonal increase in service calls generated by the proposed Project would be spread among several agencies, the increased demand on public service providers is not expected to result in the need for new or altered governmental facilities to maintain adequate service ratios. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Local or Regional Utility Services

Construction of the Sites Reservoir Inundation Area and Sites Dam would eliminate the existing access to the communication tower array on Logan Ridge (southeast side of the proposed Sites Reservoir). However, an alternate new road (Com Road) would be constructed outside of the reservoir footprint to allow continued maintenance access to the communication tower and therefore would not result in a disruption to this utility. This would, therefore, result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project construction ground-disturbing activities, such as excavation and trenching, have the potential to directly interrupt electrical, cable, and gas utilities. Activities associated with the Delevan and TRR pipeline installation and the construction of the foundations for the South Bridge and high voltage Delevan Transmission Line towers also have the potential to interrupt utilities. Disruptions of utility services resulting from intentional de-energizing of lines, relocation or modification of existing utility infrastructure, or from unintentional damage to utility infrastructure during Project construction, operation, or maintenance activities would likely be localized because the majority of electrical, cable, and communication lines in the Primary Study Area serve the local population. Potential infrastructure damage is expected to be repaired soon after discovery and reporting of the damage. Thus, disruption to utility services is not expected to continue for extended periods of time, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. A disruption to existing utilities, if it occurred for an extended period of time, would be a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Construction of the Sites Reservoir Inundation Area and the associated Road Relocations and South Bridge is expected to disrupt operation of utilities and eliminate existing access roads at those facility locations. Within the Sites Reservoir Inundation Area (which includes the location of the South Bridge) and along several of the roads that comprise the routes to Project facility sites, there are buried and overhead cables and electric distribution lines. All parcels within the Sites Reservoir Inundation Area footprint would be acquired for the Project and the structures within the Reservoir Inundation Area would be demolished. Existing aboveground utility equipment would be removed as part of development of the Sites Reservoir (and underground utility equipment would be left in place). Operation of those utilities within the Sites Reservoir Inundation Area would, therefore, not be disrupted, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The footprint of the proposed Holthouse Reservoir would conflict with existing WAPA high-voltage 500-kV and 230-kV transmission lines. This conflict would require the relocation of eight transmission towers, resulting in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The proposed TRR and Delevan pipelines would cross an identified PG&E natural gas pipeline, as well as an existing PG&E high-voltage 230-kV transmission line. These crossings would be accomplished with the bore and jack construction method to avoid disruption of the gas pipeline and the transmission line towers. The proposed Delevan Transmission Line would also cross the existing natural gas pipeline and 230-kV transmission line. These crossings would be accomplished by siting transmission line towers away from the existing utilities, and maintaining required minimum clearances between the two transmission lines by using towers approximately twelve feet higher than the existing transmission towers. Although a disruption is not expected, if construction activities were to cause a disruption to either of these utilities, the disruption would result in a **significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The Project Buffer would surround the Project facilities; within that buffer, during Project construction, all existing structures and utilities would be removed and a perimeter fence would be installed. Because the buffer lands between the Project facility footprints and the buffer boundary would be acquired for the Project prior to the removal of utilities, there would be **no impact** on existing utilities that are currently located within that buffer area, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, operation and maintenance activities (i.e., fence maintenance and periodic boundary fuel break construction and maintenance) that would occur on the buffer lands between the Project facility footprints and the Project Buffer boundary would have **no impact** on existing utilities (because they would have been removed during Project construction), when compared to Existing Conditions and the No Project/No Action Alternative.

During Project construction activities, if any existing and currently unidentified utilities are discovered and Alternative A facilities would conflict with those utilities, the conflict would result in a **significant impact** on the utility, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operations and maintenance would have a **less-than-significant impact** on utilities, when compared to Existing Conditions and the No Project/No Action Alternative, because once the Project utilities are installed, conflicts with existing utilities are not expected.

Impact Services-2: A Decline in Property Tax or Fee Revenues that Would Lead to a Substantial Decrease in Public Services

Project-related land acquisition required for implementation of Alternative A would result in a decrease in property tax receipts in the Primary Study Area. The annual property tax amount that would be removed from the Glenn County annual tax revenues would be $28,428, or approximately 0.033 percent, of the overall revenues for Glenn County. The annual property tax amount that would be removed from the Colusa County annual tax revenues due to the Project would be $252,366, or approximately 0.415 percent, of the overall revenues for Colusa County. These annual tax revenue losses are not expected to affect funding to the point where it would substantially decrease public services, resulting in a **less-than-significant impact** to public services, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-3: Exceed the Wastewater Treatment Requirements of the Applicable Regional Water Quality Control Board

Project construction, operations, and maintenance of the proposed facilities included in Alternative A would not generate wastewater that would exceed Regional Water Quality Control Board requirements. During Project construction, portable toilets would be located at Project facility sites and would be serviced by an appropriate provider, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operations and maintenance, minimal wastewater would be generated by the Project, with the majority generated at the Recreation Areas, and smaller amounts generated at the staffed Field Office Maintenance Yard, TRR Pumping/Generating Plant, and Delevan Pipeline Intake Facilities. The Recreation Areas would have vault toilets, and the two recreation areas that would provide potable water would have their own water treatment systems. The Field Office Maintenance Yard would have its own septic system, and the TRR Pumping/Generating Plant and Delevan Pipeline Intake Facilities would have portable toilets. These Project facilities would, therefore, have **no impact** on wastewater treatment agencies' abilities to meet wastewater treatment requirements, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-4: The Need for Expansion of Existing Wastewater Treatment, Water Treatment, Stormwater, and/or Landfill Facilities

During Project construction of the proposed facilities included in Alternative A, portable toilets would be provided at all proposed facility construction sites. Water would be provided by truck (or from the Sacramento River for in-river or near-river construction activities). No stormwater facilities exist at the Project facility locations. At most of the Project facility sites, minimal construction debris would be generated because the sites are currently undeveloped. In addition, excavated materials are expected to be re-used during Project construction to the extent feasible. Construction debris from the demolition of existing structures and fencing within the Sites Reservoir Inundation Area and from demolition of existing structures within the footprints of other proposed Project facilities would be transported and disposed of at suitable landfills, and recycling of wood, metal, and other materials would occur. Adequate landfill capacity exists in the Primary Study Area to accommodate the construction debris that would be generated. Therefore, expansion of existing wastewater treatment, water treatment, and landfill facilities would not be needed, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

During Project operations and maintenance, wastewater and solid waste would be generated at the Recreation Areas (vault toilets would be installed there) and the Field Office Maintenance Yard (which includes an on-site septic system). Wastewater would also be generated at the TRR Pumping Generating Plant and the Delevan Pipeline Intake Facilities (portable toilets would be provided). Water treatment that would be needed at the two recreation areas that would provide potable water would have their own water treatment systems. Stormwater management is included in the Project to minimize erosion. The need to provide wastewater and solid waste utility services during Project operations and maintenance would not necessitate the expansion of existing local or regional wastewater treatment and/or landfill facilities. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-5: Require New or Expanded Water Supply Entitlements and Resources

During Project construction of proposed facilities included in Alternative A, water that is needed at Project facility sites would be provided by truck (or from the Sacramento River for in-river or near-river construction activities). No new or expanded water supply entitlements and resources would be necessary for Project construction, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The Project's operations **and** maintenance would require new or modified water rights, water supply, and operating agreements. The specific conditions of these rights and agreements are not known at this time. It is anticipated that these rights and agreements would be formulated to protect existing beneficial uses associated with existing water rights, and that the action to obtain new or modified water rights, water supply, and operating agreements would be evaluated pursuant to the State's water rights laws. Therefore, there would be **a less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Services-6: Non-Compliance with Federal, State, and Local Statutes and Regulations Related to Solid Waste

Complying with federal, State, and local statutes and regulations pertaining to solid waste is not expected to be an issue for the Project because construction contractors would be required to dispose of construction waste in accordance with federal, State, and local regulations, as a requirement of the Project construction contract specifications. In addition, adequate landfill capacity exists in the Primary Study Area to accommodate the construction debris that would be generated. Therefore, would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project operations, including trash removal at recreation areas and debris removal from boat ramps, reservoirs, and dam embankments, would not adversely affect solid waste facilities or transporters located in or serving the Primary Study Area because adequate capacity exists in existing local landfills and waste would be delivered to the landfills using appropriate transporters. In addition, Project operations would not restrict the facilities or transporters from complying with federal, State, and local solid waste regulations. Therefore, there would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

29.3.7 Impacts Associated with Alternative B

29.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**); property tax or fee revenues affecting public services (**Impact Services-2**); wastewater treatment requirements of the applicable Regional Water Quality Control Board (**Impact Services-3**); the need to expand existing wastewater treatment, water treatment, stormwater, and/or landfill facilities (**Impact Services-4**); water supply entitlements and resources (**Impact Services-5**); and compliance with federal, State, and local solid waste statutes and regulations (**Impact Services-6**); would be the same as described for Alternative A for the Extended and Secondary study areas.

29.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public services and utilities:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

Alternative B includes the construction of a 1.81-MAF reservoir. The increased reservoir size necessitates the addition of two saddle dams and the movement of various associated Project features. The Alternative B Delevan Transmission Line would differ from Alternative A. Alternative B includes no transmission line alignment between the Sacramento River and the WAPA/PG&E transmission line. The transmission line would be approximately three miles long, from the proposed Sites Electrical Switchyard to the WAPA/PG&E transmission line. The Alternative B Road Relocations and South Bridge would differ slightly from those included for Alternative A. The lengths of the saddle dam access roads included in Alternative A would be reduced in Alternative B because the dams would be larger and would be located closer to the main roads. In addition, an extension of an access road would be constructed for Alternative B to provide access from Saddle Dam 3 to saddle dams 1 and 2. Alternative B would replace the Delevan Pipeline Intake Facilities with the Delevan Pipeline Discharge Facility. The Delevan Pipeline would be operated as a release-only pipeline, so the associated Delevan Pipeline Discharge Facility would, therefore, not include a fish screen or any of the facilities needed for the pumping and generating operations that are included for Alternative A.

However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**); property tax or fee revenues affecting public services (**Impact Services-2**); wastewater treatment requirements of the applicable Regional Water Quality Control Board (**Impact Services-3**); the need to expand existing wastewater treatment, water treatment, stormwater, and/or landfill facilities (**Impact Services-4**); water supply entitlements and resources (**Impact Services-5**); and compliance with federal, State, and local solid waste statutes and regulations (**Impact Services-6**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**); property tax or fee revenues affecting public services (**Impact Services-2**); wastewater treatment requirements of the applicable Regional Water Quality Control Board (**Impact Services-3**); the need to expand existing wastewater treatment, water treatment, stormwater, and/or landfill facilities (**Impact Services-4**); water supply entitlements and resources (**Impact Services-5**); and compliance with federal, State, and local solid waste statutes and regulations (**Impact Services-6**) as described for Alternative A.

In addition to the changes in Project facility locations and sizes mentioned above, Alternative B would result in fewer RVDs at Sites Reservoir than for Alternative A (358,049 RVDs for Alternative B versus 360,975 RVDs for Alternative A). However, this difference in recreation use would have the same physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**) as described for Alternative A.

29.3.8 Impacts Associated with Alternative C

29.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative C, as they relate to physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**); property tax or fee revenues affecting public services (**Impact Services-2**); wastewater treatment requirements of the applicable Regional Water Quality Control Board (**Impact Services-3**); the need to expand existing wastewater treatment, water treatment, stormwater, and/or landfill facilities (**Impact Services-4**); water supply entitlements and resources (**Impact Services-5**); and compliance with federal, State, and local solid waste statutes and regulations (**Impact Services-6**); would be the same as described for Alternative A for the Extended and Secondary study areas.

29.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public services and utilities:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline

- Delevan Pipeline Electrical Switchyard

The Delevan Transmission Line and Delevan Pipeline Intake Facilities included in Alternative C are the same as those included in Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public services and utilities as described for Alternative A.

The Sites Reservoir Inundation Area and Dams and Road Relocations and South Bridge included in Alternative C are the same as included in Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to public services and utilities as described for Alternative B.

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, these differences in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**); property tax or fee revenues affecting public services (**Impact Services-2**); wastewater treatment requirements of the applicable Regional Water Quality Control Board (**Impact Services-3**); the need to expand existing wastewater treatment, water treatment, stormwater, and/or landfill facilities (**Impact Services-4**); water supply entitlements and resources (**Impact Services-5**); and compliance with federal, State, and local solid waste statutes and regulations (**Impact Services-6**) as described for Alternative A.

In addition to the comparisons of Project facilities mentioned above, Alternative C would result in more RVDs at Sites Reservoir than for Alternative A (373,659 RVDs for Alternative C versus 360,975 RVDs for Alternative A). However, this difference in recreation use would have the same physical impacts associated with new or physically altered governmental facilities or the need for new or physically altered governmental facilities (the construction of which could cause significant environmental impacts) in order to maintain acceptable service ratios, response times, or other performance objectives for public services and disruptions to local or regional utility services (**Impact Services-1**) as described for Alternative A.

29.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 29-9 for the impacts that have been identified as significant or potentially significant.

Table 29-9
Summary of Mitigation Measures for
NODOS Project Impacts to Public Services and Utilities

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Services-1: A Substantial Adverse Physical Impact Associated with the Provision of New or Physically Altered Governmental Facilities or the Need for New or Physically Altered Governmental Facilities (the Construction of which could cause Significant Environmental Impacts) in order to Maintain Acceptable Service Ratios, Response Times, or Other Performance Objectives for the Following Public Services: Fire Protection, Police Protection, Schools, Parks, and/or Other Public Facilities, and Disruptions to Local or Regional Utility Services				
Impact Services 1a: Damage to or Disruption of Existing Utility Services	All Project Facilities	Significant	Mitigation Measure Services-1a: Avoid Damage to or Disruption of Existing Utility Services	Less than Significant
Impact Services-1b: Project Facility Siting Impacts to Utilities				
500-kV and 230-kV Transmission Lines	Holthouse Reservoir (construction)	Significant	Mitigation Measure Services-1b: Perform Utility Relocation or Modification	Less than Significant
Gas Pipeline and 230-kV Transmission Line	Delevan Pipeline, TRR Pipeline, and Delevan Transmission Line(construction)	Significant	Mitigation Measure Services-1a: Avoid Damage to or Disruption of Existing Utility Services	Less than Significant
Impact Services 1c: Project Facility Conflicts with Currently Unidentified Utility Systems	All Project Facilities	Significant	Mitigation Measure Services-1a: Avoid Damage to or Disruption of Existing Utility Services	Less than Significant

Note:
LOS = Level of Significance

Mitigation Measure Services-1a: Avoid Damage to or Disruption of Existing Utility Services

To minimize impacts to utility service providers by damage or disruption caused by the Project's construction, operation, and/or maintenance, DWR and Reclamation shall implement the following measures during Project construction to minimize impacts to existing utility infrastructure (whether it is currently identified or is discovered during Project construction):

- **Permits:** The Construction Contractor shall obtain utilities excavation or encroachment permits, as necessary, before initiating any work with potential to affect utilities.
- **Locating Line:** Utility locations shall be identified through field surveys and the use of the Underground Service Alert services. Any buried utility lines shall be clearly marked before initiation of any ground-disturbing construction activity.

- **Clearing Right-of-Way and Road Access:** If necessary, infrastructure shall be removed or reinforced in coordination with all potential service providers known to have, or potentially having, utility infrastructure in the vicinity of the Project facility.
- **Response Plan (Construction):** The Construction Contractor shall prepare a Response Plan to address potential accidental damage to utility infrastructure prior to the start of Project construction. The Response Plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. The Response Plan shall be circulated to the potentially affected service system providers for review and approval prior to the start of the construction activities. Worker education training in response to such situations shall be conducted by the Contractor.
- **Response Plan (Operation and Maintenance):** DWR and Reclamation shall prepare a Response Plan to address potential accidental damage to utility infrastructure prior to the start of Project operation. The Response Plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and Project facility personnel. The Response Plan shall be circulated to the potentially affected service system providers for review and approval prior to the start of Project operation. Worker education training in response to such situations shall be conducted by DWR and Reclamation or such party that they designate.

Mitigation Measure Services-1b: Perform Utility Relocation or Modification

For each section of a utility line that would need to be relocated or modified as a result of Project construction and/or operation, DWR and Reclamation shall implement the following measures:

- **Permits:** The Construction Contractor shall obtain utilities excavation or encroachment permits, as necessary, before initiating any work with potential to affect utility lines.
- **Locating and Staking Line:** Locations for relocated utility lines shall be identified in coordination with affected service providers. As part of this effort, field surveys shall be conducted and the Underground Service Alert services shall be used to ensure that there are no conflicts with other existing utility lines. After the alignment of the line has been determined, a survey shall be conducted to map the route of the line. The results of the survey shall be plan and profile drawings, which shall be used to spot the poles and/or towers. After exact positions have been fixed, a stake shall be driven to indicate the center of the structure or pole.
- **Utilities Modification and Relocation Plan:** The Construction Contractor shall prepare a Utilities Modification and Relocation Plan prior to the start of Project construction. The Utilities Modification and Relocation Plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers and include a description of how utilities infrastructure shall be modified or relocated and identification of precise alignment where utility lines shall be relocated. The Utilities Modification and Relocation Plan shall be circulated to the potentially affected service system providers for review and approval prior to the start of the Project construction activities. Worker education training in response to such situations shall be conducted by the Construction Contractor.
- The Construction Contractor shall stage utility line modifications and relocations in a manner that minimizes interruption of service.

- The Construction Contractor shall follow local, State, and federal regulations regarding utilities and service systems location and construction to minimize potential disruption of services and damage to the utilities and service system infrastructure.

Implementation of **Mitigation Measure Services-1a** and **Services-1b** would reduce the level of significance of Project impacts to **less-than-significant**.

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30. Visual Resources

30.1 Introduction

This chapter describes the visual resources setting for the Extended, Secondary, and Primary study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction. Visual resources include the natural and artificial landscape features that contribute to perceived visual images and the aesthetic value of a view.

The regulatory setting for visual resources is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses primarily on the Primary Study Area. Potential impacts in the Secondary and Extended study areas were evaluated and discussed qualitatively. Potential local and regional impacts from constructing, operating, and maintaining the alternatives were described and compared to applicable significance thresholds. Mitigation measures are provided for identified significant or potentially significant impacts, where appropriate.

30.2 Environmental Setting/Affected Environment

30.2.1 Introduction

Visual resources consist of the natural and artificial features that create the perceived visual character and sensitivity of a landscape. Several factors are considered when characterizing the existing visual resources of the study areas to help determine the degree to which those resources or landscapes may be affected by the Project. The principal existing visual factors considered in this analysis are defined below and include: Visual Quality, Viewer Types and Volumes, Viewer Exposure, and Visual Sensitivity.

Visual Quality is defined as the overall visual impression or attractiveness of an area as determined by the particular landscape characteristics, including landforms, rock forms, water features, and vegetation or land use patterns. The attributes of vividness (power or memorability of landscape components), intactness (integrity and freedom of landscape from encroaching elements), and unity (coherence and harmony of landscape as a whole) contribute to the overall visual quality of an area (FHWA, 1988).

For the purposes of this analysis, visual quality is defined according to three levels:

- **Low –** defined as visual resources that are indistinctive, and generally lacking in cohesiveness and natural or cultural visual resource amenities typical of the region
- **Moderate** – defined as visual resources typical or representative of the region's natural and/or cultural visual amenities
- **High** – defined as visual resources that are distinctive or exemplary of the region's natural or cultural scenic amenities

Viewer Types and Volumes of use pertain to the types (i.e., public viewers including recreationists and motorists) and amounts (i.e., number of recreationists or motorists) of use that various land uses receive. Land uses that derive value from the quality of their settings are considered potentially sensitive to changes in visual setting conditions. Land uses within the Project area that may be sensitive to change in visual conditions include designated scenic highways, designated scenic roads, and designated park, recreation and natural areas.

Viewer Exposure addresses the variables that affect viewing conditions from potentially sensitive areas. Viewer exposure considers the following factors:

- **Landscape visibility:** Whether the line of sight is open and panoramic to the Project facility sites or is restricted by terrain, vegetation, and/or structures.
- **Viewing distance:** The proximity of viewers to the Project. Viewing distances are described according to whether the Project activities would be viewed within the foreground (within 0.5 mile), middleground (0.5 to 2.0 miles), or background (beyond 2.0 miles) zone.
- **Viewing angle:** Whether the Project would be viewed from above (superior), below (inferior), or from a level (normal) line of sight. Viewing angle and extent of visibility considers the relative location of the Project facility to the viewer and whether visibility conditions are open, or are limited by intervening vegetation, terrain, or structures.
- **Number of viewers:** How many viewers would see the Project facilities.
- **Duration of view:** How long (days, hours, or minutes)] that viewers would see the Project facilities.

Visual Sensitivity is a combined measurement of the overall susceptibility of an area or viewer group to adverse visual or aesthetic impacts, given the combined factors of landscape visual quality, viewer types, and exposure conditions (FHWA, 1988).Visual sensitivity is reflected according to high, moderate, and low visual sensitivity ranges. The viewer groups for the Project can be classified as three types:

- **Residents:** Residents are considered to be a sensitive viewer group because of the Project’s long-term presence and the sensitivity with which people typically regard their places of residence. Residents are also considered to have frequent opportunities to experience the views from their homes, and view duration can be lengthy. Residents in the vicinity of Project facilities have views of varying landscapes and quality.
- **Recreationists:** Recreationists are considered to be a sensitive viewer group because they generally value and are more aware of the aesthetic quality of their surroundings than commuters or people at work. Their focus is usually on their surroundings while they are engaging in recreational activities. Individual views can be of an extended duration, although they may be limited in frequency. In addition, the recreation activity they are engaging in is usually enhanced by their surroundings. Recreation areas in the vicinity of the Primary Study Area include East Park Reservoir, the Delevan National Wildlife Refuge, and the Sacramento River and shoreline near the proposed Delevan Pipeline Intake Facilities. There are several State Recreation Areas and designated wildlife refuges within the Secondary and Extended study areas.
- **Motorists:** Motorists are considered to have lower sensitivity than residents and recreationists because views from the roadway are fleeting and short-term, are partially obstructed by the vehicle, and the drivers’ attention is primarily concentrated on maneuvering the vehicle on the roadway. It is acknowledged that scenic driving for pleasure is a valid recreational activity and the sensitivity of such viewers has not been ignored in this analysis. However, because of the short view time, the distraction that would occur from the actual driving activity and the obstructed views within vehicles, these travelers (drivers and passengers) are not considered highly sensitive viewers. The viewshed

from within vehicles sitting higher off the ground, such as commercial trucks, is greater than from passenger vehicles, but it is still of relatively short duration and can be partially obstructed by the vehicle itself. Portions of the Primary Study Area would be located within the viewshed of motorists on the I-5, Old Highway 99W, SR 45, Maxwell Sites Road, and several county roads.

30.2.2 Extended Study Area

The visual landscape for the Extended Study Area[1] is extremely varied; the area includes State and federal service areas providing water supply delivery to agricultural, industrial, and municipal water uses, and several wildlife refuges.

Availability, amount, and source of water supply for delivery by the CVP and SWP for the purpose of agricultural, industrial, and municipal water uses varies annually, and depends on several factors, including:

- Natural seasonal variability in weather and precipitation
- Ongoing implementation of agency programs and management plans, which cause a change (reduction or increase) in exports, allocation, or peak diversion rates

Due to this variability, it is complex to characterize a stable baseline visual resources environmental setting, or link an individual action to a change in visual resources, for the service areas within the Extended Study Area. Land uses in these areas vary considerably, depending on the location and include agricultural, municipal and industrial, commercial, open space, grazing, and timber production. Of these uses, agriculture dominates the Extended Study Area, therefore, much of the visual resources in the Extended Study are associated with active agricultural land and the conveyance systems that provide water service throughout the State, as well as the rural residences and towns, and the auxiliary structures associated with agricultural practice.

The Extended Study Area includes San Luis Reservoir, which is located approximately 170 miles southeast of the Primary Study Area in Merced County. San Luis Reservoir provides short-term offstream storage for water taken from the Sacramento-San Joaquin Delta, and is used to regulate distribution through the California Aqueduct. The reservoir is part of the San Luis Reservoir State Recreation Area, which provides recreational opportunities such as fishing, boating and camping to the public (Reclamation and CDPR, 2012). The existing visual environment of the areas surrounding San Luis Reservoir is hilly grassland interspersed with stands of oak trees and scrub habitat. San Luis Reservoir is drawn down annually, typically between March and the end of August. Because of the annual draw down, the aesthetic character of the reservoir is seasonal and depends primarily on annual precipitation; during Dry to Critical years, low water levels in the reservoir can expose wide areas of barren shoreline. During Normal to Wet years, higher water levels in the reservoir support riparian and upland vegetation, which is generally considered by recreationists to be a scenic vista of high aesthetic value. State Route (SR) 152 in Merced County is an officially designated State Scenic Highway that follows the northern shoreline of San Luis Reservoir for approximately 6 miles, offering extended views of the waterbody and its surroundings (Caltrans, 2012).

The Extended Study Area includes several other reservoirs operated within the SWP and CVP service areas and along the California Aqueduct. The most notable among them include the Tri-Dam Reservoir

[1] The Extended Study Area is defined as the portions of the CVP and SWP service areas that could be affected by Project operations, located within 39 counties

Complex (New Hogan, Comanche, and Pardee reservoirs), New Melones Reservoir, Don Pedro Reservoir, Lake McClure, Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris. These other reservoirs provide recreational opportunities to thousands of visitors each year. Because of the variability in annual precipitation, the existing visual quality of these reservoirs is seasonal and can range from moderate to high.

Level 4 wildlife refuge water supply delivery areas that could be affected by Project operations are located within the Extended Study Area. These delivery areas are described in Chapter 1 Introduction and shown in Figure 1-7 in Chapter 1 Introduction. The existing environmental settings of the wildlife refuges included in the Extended Study Area are of high visual quality, because they consist of vast undisturbed lands that include wetlands, grassland, and riparian areas with high biodiversity.

30.2.3 Secondary Study Area

The Secondary Study Area is defined as the CVP and SWP reservoirs, rivers, creeks, and associated floodplains that could be affected by Project operations, located in 22 counties (14 of the 22 counties are also located in the Extended Study Area). The individual waterbodies included in the Secondary Study Area are considered to be scenic resources of high visual quality, and are listed below:

- Trinity Lake
- Lewiston Lake
- Trinity River
- Klamath River (downstream of Trinity River)
- Whiskeytown Lake
- Spring Creek
- Shasta Lake
- Keswick Reservoir
- Clear Creek
- Sacramento River
- Lake Oroville
- Thermalito Complex (Diversion Pool, Forebay, Afterbay)
- Feather River
- Sutter Bypass
- Yolo Bypass
- Folsom Lake
- Lake Natoma
- American River
- Sacramento-San Joaquin Delta
- Suisun Bay
- San Pablo Bay
- San Francisco Bay

Several State Recreation Areas are located along the lakes, reservoirs, and rivers, and provide ample recreational opportunities and scenic views of open water and natural vegetation to recreationists, residents, and motorists. There are several State-designated scenic highways with views of the Secondary Study Area waterbodies (Caltrans, 2012).

The Sacramento River flows between the Cascade, Coast Range, and Sierra Nevada ranges through the Central Valley. Throughout the year, the volume of water in the Sacramento River varies greatly, accounting for some degree of visual change in the river. The Red Bluff Pumping Plant (RBPP) (Photo 26 on Figure 30-2Q), which is included in the Secondary Study Area, is located on the Sacramento River approximately two miles southeast of the City of Red Bluff, in Tehama County. The RBPP site's existing visual character is highly developed on the generally scenic Sacramento River. To the west of the RBPP, the area is characterized by suburban, industrial, and transitioning agricultural land uses. Across the Sacramento River to the east of the RBPP, the area is characterized by the open natural vegetation of the Red Bluff Recreation Area, beyond which lies agricultural and rural residential land uses. There are no State-designated highways in the viewshed of the RBPP.

30.2.4 Primary Study Area

30.2.4.1 Visual Environment

<u>Regional Landscape Description</u>

Glenn County

Glenn County's landscape consists of urban development in relatively flat land that is associated with small cities and towns (e.g., Orland, Willows, Hamilton City, and Artois), rural residences beyond the borders of the communities, undeveloped open space, agricultural land (crops and orchards), industrial and highway commercial land uses along the I-5 corridor, and recreation areas (Black Butte Reservoir, Sacramento River, wildlife areas, and wildlife refuges). Away from the town centers, fewer roadways exist, and public access to lands is limited.

The western portion of the county consists of hilly forested terrain and oak woodlands. In the lowlands, the landscape is characterized by grassland and woodland vegetation, with occasional wetlands, vernal pools, and riparian areas. The attributes of the landscape change over the course of a year in response to seasonal changes and weather. Vegetation, agricultural crops, and land use patterns vary according to the time of year and farming activities. For instance, the grasslands and cultivated areas of the county are a lush green in spring and early summer; as the hot weather continues, the grasslands turn a honey-brown hue, and the crops mature.

Water features in Glenn County include Black Butte Reservoir, which provides flood protection for local towns and agricultural lands. It is located on Stony Creek west of the City of Orland and the Sacramento River, which, in places, forms the county's eastern border with Butte County.

Although Glenn County contains numerous areas and viewsheds with relatively high scenic value, there are no officially designated scenic vista points. Scenic resources include the Sacramento River and streams, foothill and mountain areas, agricultural landscapes on the valley floor, the Sacramento National Wildlife Refuge, glimpses of wildlife, and a distant view of Mount Lassen. The Glenn County General Plan identifies twelve important biological resource areas in Glenn County that are of outstanding scenic value. Six of the areas (Llano Seco Unit of the Upper Butte Basin Wildlife Area, Oxbow Waterfowl Area, Oxbow Heron Rookery, Princeton Riparian Woodland, Sacramento River Wildlife Area, and Sacramento River Oxbow Preserve) are associated with the Sacramento River and are intended to protect the unique riparian forest, marsh, and floodplain bordering the Sacramento River. Two of the areas (St. Johns Mountain and Sheetiron Mountain) are within the Mendocino National Forest. The remaining areas are the Sacramento National Wildlife Refuge, Black Butte and Stony Gorge reservoirs, and Orland Buttes (Glenn County, 1993).

There are no eligible or State-designated scenic highways within Glenn County (Caltrans, 2012); however, SR 45 and SR 162 have been recommended for scenic highway status due to the presence of many unofficial scenic vistas of the features listed above. It has also been suggested that SR 32 and County Road 99W be considered for scenic highway status (Glenn County, 1993).

The visual quality of Glenn County is moderate to high due to the expansive open space provided by the Yolla Bolly, Middle Eel, and Snow Mountain designated wilderness areas in the west, aforementioned biological resource areas, large agricultural areas, and the undeveloped upland areas on the west. Existing sources of light and glare in the County include residential, agricultural, commercial and industrial development, vehicles traveling on roadways, and safety lighting on tall structures, such as transmission towers and cell towers.

Colusa County

Colusa County's landscape includes urban development in relatively flat terrain. Cities and small towns, such as Williams, Colusa, Arbuckle, Princeton, Stonyford, and Maxwell, exist along the major transportation corridors (I-5 and the state highways in the county). Land uses include the rural residences beyond the borders of the communities, undeveloped open space, agricultural land (crops and orchards), industrial and highway commercial land uses along the I-5 corridor, and recreation areas (several wildlife refuges and the Sacramento River). Away from the town centers, fewer roadways exist, and public access to lands is limited.

The western portion of the county is typified by the undulating hills of grassland and oak woodland terrain which transition to rugged Klamath and North Coast mountain ranges reaching elevations in excess of 7,000 feet above the valley floor. In the lowlands, the landscape is characterized by grassland, agricultural and rural landscapes, with occasional wetlands, vernal pools, and riparian areas. The agricultural landscape is dominated by crops (e.g. rice, almonds, vegetables, tomatoes, wheat, hay), rangeland livestock, and other ancillary facilities including outbuildings, tractors, irrigation, and drainage works. Vegetation, agricultural crops, and land use patterns vary according to the time of year and farming activities. For instance, the rangelands and cultivated areas of the county are a lush green in spring and early summer; as the hot weather continues, the grasslands turn a honey-brown hue, and the crops mature.

Although Colusa County contains numerous areas and viewsheds with relatively high scenic value, there are no officially designated scenic vista points in the County. Scenic resources and unofficial scenic vistas include features, such as the Sacramento River, Snow Mountain, Sutter Buttes, Mendocino National Forest, Colusa National Wildlife Refuge, Delevan National Wildlife Refuge, Sacramento National Wildlife Refuge, Willow Creek-Lurline Wildlife Management Area, North Central Valley Wildlife Management Area, Colusa Bypass Wildlife Area, Sacramento River Wildlife Area, Colusa-Sacramento State Recreation Area, as well as the vast agricultural lands located throughout the County (Colusa County, 2011).

There are no officially designated scenic highways or scenic corridors in Colusa County (Caltrans, 2012). However, there are two Eligible State Scenic Highway Corridors in Colusa County that have not yet been officially designated: SR 20 in the southwest between the county line and the junction of SR 20 and SR 16, and SR 16 between the county line and the aforementioned junction (Colusa County, 2011).

The general visual quality of Colusa County is moderate to high due to the expansive open space provided by the large agricultural areas, water features (including rivers, lakes, reservoirs, and wetlands), and the undeveloped upland areas on the west. Existing sources of light and glare include residential, agricultural, commercial and industrial development, vehicles traveling on roadways, water features, and safety lighting on tall structures, such as transmission towers and cell towers.

Project Viewshed

The visual sphere of influence (SOI) for the Project represents the area from which the Project has the potential to be visible. Beyond the SOI, a project's features would not be easily visible due to screening, or would be of such a small size in the background field of view that significant impacts to visual resources would not be expected. Depending on the location of the viewer, views toward the proposed Sites Reservoir could be blocked by intervening terrain, trees, shrubs, or other features in the viewer's immediate foreground. For this project, hills that would form the outer boundaries of the proposed reservoir are considered to also form the visual SOI for the Sites Reservoir. The SOI for the other Project facilities would vary because of the screening effects of minor variations in terrain, adjacent development, or vegetation, which would limit views of the facilities. The Project viewshed for the three alternatives was determined by mapping a one-mile buffer around Project facilities. This viewshed is considered sufficient given the topography of the study areas, the height and massing of Project facilities, and the number and location of sensitive receptors in the study areas. Additionally, the adopted General Plans of Glenn and Colusa counties each encourage the preservation of existing agricultural land uses and containment of growth and development to urban infill and revitalization within existing towns and cities (Colusa County, 2012; Glenn County, 1993).

Project Facility Footprints Landscape Description

Figures 30-1A to 30-1D show the locations of the proposed Project facilities and where landscape character photographs were taken when conducting Project site visits. They also show the direction that the camera was pointed when taking the photographs. Figures 30-2A to 30-2U are landscape character photos that are intended to aid the reader in understanding the nature of the area in which the Project would be constructed, operated, and maintained. Descriptions of the landscapes at and adjacent to the proposed Project facility footprints are provided below.

Sites Reservoir Inundation Area

The affected environment of the Sites Reservoir Inundation Area is the same for the two proposed reservoir sizes (and all three alternatives). The landscape of the proposed inundation area is characterized by moderate to low elevation and northwest-southeast trending ridgelines, and separated by valleys of varying steepness and width. Ridgelines surrounding the proposed reservoir rise to between approximately 500 and 1,200 feet above mean sea level. Overall, the visual quality of the proposed reservoir inundation area is considered high because the natural foothills landscape has been largely preserved and unaltered. Visual sensitivity is moderate to high because scenic views from the proposed inundation area can be extensive in duration and consist of a mixture of low-lying rangeland, active agricultural development and livestock in the foreground, hilly grasslands in the middleground, with occasional views of densely vegetated ridgelines and hillsides in the background to the west.

The rural town of Sites is located within the proposed reservoir inundation area (Figures 30-2B and 30-2C). The town consists of a concentrated grouping of 13 rural residences and peripheral structures including fences, sheds, garages, barns, silos, pump houses and water towers, flat agricultural land, and mature vegetation including native and ornamental trees. South of the town of Sites, the proposed inundation area consists predominantly of low-lying grassy rangeland interspersed with a few rural residences and peripheral structures, and oak trees. North of the town, the lowland transitions to hilly rangeland, with a few farmed parcels, rural residences, peripheral structures, and interspersed wetlands at lower elevations. In total, approximately 26 houses, 31 barns, 27 sheds, 4 shops, and 20 other peripheral structures are located within the proposed inundation area.

There are no State-designated scenic highways within or near the proposed Sites Reservoir Inundation Area (Caltrans, 2012). However, Maxwell Sites Road and Sites Lodoga Road, which traverse the proposed inundation area from southeast to northwest, have been recommended for scenic designation

(Colusa County, 1989). Viewers of the proposed reservoir inundation area are limited to residents and motorists who travel on those roadways.

Predominantly unpaved dirt roads provide access to residences and farming operations within the proposed inundation area. Automobiles traveling along the unpaved roads generate large plumes of dust visible from a distance of up to 1 mile. Existing sources of light and glare are associated with residences and peripheral structures, and the automobiles that use the roads. The proposed Sites Reservoir Inundation Area is shown in Figures 30-2A through 30-2C.

Sites Reservoir Dams

Sites Reservoir would require the construction of several dams; seven saddle dams are proposed for Alternative A and nine saddle dams are proposed for Alternatives B and C; Golden Gate Dam and Sites Dam are proposed for Alternatives A, B, and C. The dam locations for Alternatives A, B, and C are of high visual quality due to the presence of several distinctive rock outcroppings, and undisturbed and abundant vegetation. There are no State-designated scenic highways near or with views of the proposed dam locations (Caltrans, 2012), nor are there existing sources of light or glare. Viewers of the proposed dam locations are limited to motorists along the county roadways and are typically of short duration due to area terrain; therefore, visual sensitivity is low to moderate.

Golden Gate Dam would be constructed between two hillsides approximately two miles northeast of the town of Sites. The existing landscape consists of rolling grassland and vegetated rocky steppes, with several tree snags located in the lowland area. The proposed Golden Gate Dam location is shown in Figures 30-2D and 30-2E.

Sites Dam would be constructed between two steep hillsides approximately 0.3 mile east of the town of Sites upon a 0.25-mile-long section of the existing Maxwell Sites Road. The landscape of the north-facing right abutment location is densely vegetated with oak woodland and other native tree species. The landscape of the south-facing left abutment is predominantly rocky outcroppings and grassland, interspersed with a few oak trees. The proposed Sites Dam location is shown in Figures 30-2E and 30-2F.

Saddle dams would be located between hilltops along the northeastern boundary of the proposed reservoir. The existing landscape generally consists of gently rolling hills vegetated with non-native grasses. Figures 30-2F and 30-2G provide a representative view of the existing landscape at the proposed saddle dam locations.

Recreation Facilities

Up to five recreation areas are proposed for Alternatives A, B, and C. The recreation facility locations are of high visual quality with many scenic views of the open grassy lowlands, and surrounding rolling hills and oak woodlands. There are no State-designated scenic highways near or with views of the proposed recreation areas (Caltrans, 2012), nor are there existing sources of light or glare. Visual sensitivity is moderate because viewers of the recreation areas are limited to residents and users of the existing county roadways. These viewers have the opportunity for extended views of the recreation area locations from Huffmaster Road and Peterson Road. There are no public views of the proposed recreation facilities from outside of the proposed inundation area. The visual character of the individual proposed recreation areas is described below (Table 30-1), and photos of the Saddle Dam, Peninsula Hills, Stone Corral, Antelope Island, and Lurline Headwaters recreation areas are included as Figures 30-2A, 30-2H, 30-2I, 30-2J, and 30-2K.

Table 30-1
Visual Character of the Proposed Recreation Areas

Figure No.	Recreation Area	Location*	Size (acres)	Existing Visual Character
30-2H	Stone Corral	Central East	235	Hilly grasslands with scattered oak tree stands
30-2I, 30-2J	Peninsula Hills	Northwest	373	Hilly oak woodlands interspersed between open rolling grasslands
30-2J	Antelope Island	Southwest	49	Hilly oak woodlands
30-2K	Lurline Headwaters	Southeast	219	Low-lying open grasslands interspersed with areas of hilly oak woodlands to the west
30-2A	Saddle Dam	Northeast	329	Gently rolling open grasslands with interspersed seasonal wetland areas

*Relative to proposed Site Reservoir Inundation Area.

Road Relocations and South Bridge

The proposed Sites Reservoir would inundate several roads within Colusa County's jurisdiction, including portions of Maxwell Sites Road, Sites Lodoga Road, Huffmaster Road, and Peterson Road. Approximately 44 miles of new public access roads and approximately two miles of new private access roads would provide construction and maintenance access to Project facilities, as well as provide public access to proposed recreation areas. There are no State-designated scenic highways near or with views of the proposed road relocations and South Bridge (Caltrans, 2012). Views of the proposed road relocations and South Bridge alignment are of high visual quality due to the abundance of open grasslands in the foreground, transitioning to rolling hills and oak woodlands in the middle- and background. Visual sensitivity is low and views are brief because viewers of the road relocations and south bridge alignment are limited to motorists along existing roads. Existing sources of light and glare include vehicles using the existing system of roads.

The portions of Maxwell Sites and Sites Lodoga roads that would be inundated by the proposed reservoir would be replaced by the proposed South Bridge serviced by approach roads from the east and west. This route would also provide access to the proposed Stone Corral Recreation Area. The existing visual character of the proposed South Bridge location traversing west from the eastern access route is dominated by rolling grasslands through the central proposed inundation area to the western terminus of the bridge. A representative view of the proposed South Bridge alignment is provided in Figure 30-2K. The western South Bridge route transitions into oak woodland and winds through approximately 2.25 miles of moderately variable topography to rejoin the existing Sites Lodoga Road.

The proposed North Road and Saddle Dam Road (both new gravel roads) would provide access to northern portions of the reservoir, the saddle dams, and the Saddle Dam Recreation Area. North Road would be improved beginning at the intersection of the existing County Road 69 and the Tehama-Colusa Canal on the east, and would follow the route of County Road 69 through hilly grassland for approximately 4.6 miles to its western terminus. The new route would then be extended west for approximately 1.8 miles through rolling grasslands interspersed with small intermittent wetlands. Saddle Dam Road would be aligned north to south for approximately two miles through similar terrain if Alternative A is implemented, and three miles if Alternatives B or C are implemented. Two residences and four peripheral structures would be demolished that are located along the North Road access route and within the Project Buffer. Public views of the existing County Road 69 are limited due to varying topography. There are no existing public views of the new segment of the North Road or Saddle Dam Road locations.

The proposed Eastside Road would connect the proposed Stone Corral Road to County Road 69, providing access to the northern portion of the reservoir, Holthouse Reservoir Complex, Golden Gate Dam and appurtenant structures, and to properties northeast of the proposed reservoir. Eastside Road and Stone Corral Road would be aligned north to south along the grassy ridgelines between the proposed reservoir inundation area on the west and the existing upland agricultural areas on the east. The proposed Eastside Road location is visible from Maxwell Sites Road on the south and County Road 69 on the north.

Along the western side of the proposed reservoir, the proposed Peninsula Road would provide access from Sites Lodoga Road to the Peninsula Hills Recreation Area. Peninsula Road would generally traverse from east to west, winding sharply through hilly oak woodland and grassland.

The proposed Sulphur Gap Road would provide access to southern portions of the proposed reservoir, the proposed Lurline Headwaters Recreation Area, private property adjacent to the proposed Com Road (shown in Photo 33 on Figure 30-2U), and connect to Huffmaster Road. Sulphur Gap Road would traverse in a generally northeast-to-southwest direction beginning in the low-lying rangeland on the east, through hilly grassland and moderately steep oak woodland, and intersecting with Huffmaster Road in the grassy rangeland at the southern tip of the proposed reservoir inundation area.

Sites Reservoir Inlet/Outlet Structure, Sites Pumping/Generating Plant, Sites Electrical Switchyard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, and Field Office Maintenance Yard

The Sites Inlet/Outlet Structure would consist of separate inlet and outlet structures connected by an approximately 0.8-mile tunnel. The inlet structure would be located on the ridgeline south of the proposed Golden Gate Dam, and the outlet structure would be located adjacent to, and would connect with, the existing Funks Reservoir. The electrical switchyard would be located north of the outlet structure. The tunnel, switchyard, and outlet structure would be located in an open hilly grassland area and rolling rangeland. The Field Office Maintenance Yard would be constructed on 18 acres southwest of and adjacent to the existing Funks Reservoir. One existing rural residence and two auxiliary structures are located in the footprint of the proposed outlet structure. Utilitarian features in the landscape include electrical distribution lines, poles, and fences. Views of the proposed facility locations are of high visual quality due to the presence of open hilly grasslands with limited development. Views from the area are obstructed by ridgelines, which focus views on the natural character of the hills in the foreground. Visual sensitivity is low because public views of this area are limited and brief due to varied topography. There are no State-designated scenic highways near or with views of the proposed intake/outlet structure and ancillary facilities (Caltrans, 2012). Existing sources of light and glare include the existing residence and vehicles using the existing Funks Reservoir maintenance roads. The existing visual character of the Outlet Structure and Pumping/Generating Plant locations is shown in Figure 30-2L. The existing visual character of the Field Office Maintenance Yard location is shown in Figure 30-2M.

Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

The Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard would be located east of and adjacent to the existing Funks Reservoir, T-C Canal, and private service road in an area of gently rolling hills vegetated with non-native grasses and scrub on the west, transitioning to flat active agricultural land on the east. The existing Funks Reservoir water levels fluctuate annually and seasonally.

At full capacity, the approximately 230-acre reservoir is a water feature of high visual quality. During Dry years and late summer months, the water retreats to expose a barren shoreline of moderate visual quality. The area surrounding Funks Reservoir consists mainly of non-native grasses. The existing reservoir outfall to Funks Creek bisects the area and is lined with riparian trees and shrubs. The proposed Holthouse Reservoir location is traversed from north to south by parallel 500-kV and 230-kV WAPA electrical transmission lines on lattice towers. There are no State-designated scenic highways or vista points near, or with views of, the proposed Holthouse Reservoir Electrical Switchyard or the Holthouse Reservoir Complex facilities (Caltrans, 2012). Views of the proposed facility locations are of moderate to high visual quality due to the presence of a seasonal water feature amidst an area with scattered utility structures. Viewers of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard area are limited to operations and maintenance staff for the existing Funks Reservoir roads and facilities, and workers in the adjacent orchards and agricultural fields; therefore, although views can be of extended duration, visual sensitivity is low to moderate. Existing sources of light and glare include Funks Reservoir facilities, vehicles using the existing service roads, and nighttime safety lighting on transmission towers. Figure 30-2N provides a view of the Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard location from the existing Funks Reservoir near Funks Creek and the Funks Dam spillway. The existing Funks Reservoir is shown in Figure 30-2M.

Glenn-Colusa Irrigation District Canal Facilities Modifications

The Glenn-Colusa Irrigation District (GCID) Canal Facilities Modifications would include construction of a new headgate structure, concrete lining of the canal for 200 feet downstream of the new headgate structure, and replacement of a railroad siphon. The new headgate structure and canal lining would be completed within a portion of the GCID Canal that is bounded on the northeast by existing GCID maintenance facilities and orchards, and on the southwest by low density industrial development, agricultural fields, single-family rural residences, and constructed wetlands. The proposed GCID Canal Headgate Structure and Canal Lining location is shown in Figure 30-2O.

The railroad siphon replacement would be constructed at the intersection of the GCID Canal and the railway on the southeast boundary of the town of Willows. The visual setting of the area is characterized by predominantly residential and light industrial land uses to the north and west, and agricultural to the south and east. The location of the GCID Canal Railroad Siphon Replacement is shown in Figure 30-2P.

These two areas are of low to moderate visual quality due to the conspicuous presence of infrastructure and industrial development amidst the low-density residential and agricultural development typical of communities in the region. Visual sensitivity is moderate due to the large number of potentially sensitive viewers in the vicinity in conjunction with limited views and low to moderate visual quality.

The topography in both areas is generally flat. Views toward the east and west beyond the facilities are obstructed by orchards and urban development, which focus views on the utilitarian character of the canal upstream and downstream of the proposed improvements. There are no State-designated scenic highways or scenic vistas in the vicinity of the proposed improvements (Caltrans, 2012). Existing sources of light and glare include nearby residential and industrial development, vehicles on nearby roads, and the existing GCID facilities.

Terminal Regulating Reservoir, Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

The TRR, Pumping/Generating Plant, and Electrical Switchyard would be located in an area of existing flat agricultural fields between McDermott Road on the east and the GCID Canal on the west. There are rural residences, farms, and auxiliary structures with views of the area. The 3.5-mile-long bidirectional TRR Pipeline and TRR Pipeline Road would be constructed between the TRR Pumping/Generating Plant southwest to the Holthouse Reservoir Spillway and Stilling Basin. The Delevan Pipeline Electrical Switchyard would be located where the existing PG&E transmission line crosses the proposed TRR Pipeline. The GCID Canal Connection to the TRR would connect the existing canal to the east side of the proposed reservoir. The TRR to Funks Creek Pipeline would connect the proposed reservoir to the existing creek to the south of the TRR location (Figure 30-2Q). Because of the minimal topographic variation within the agricultural region, views are fairly homogeneous in form, texture, and color. Foreground views are typically composed of large areas of flat agricultural land interspersed with farm roads, canals and associated infrastructure, tree clusters, electric distribution lines and poles, and occasional rural residences. The proposed facility locations are of moderate visual quality and sensitivity, because despite the homogeneity of views and the obvious imprint of humans upon the landscape, the area retains an open-space character due to the presence of agricultural crops, stands of native plants, and the minimal number of permanent structures. Views of the proposed facility location range from brief to extended, because the area is adjacent to several county roads used by motorists, existing rural residences, and agricultural fields.

Views from the proposed TRR location are of moderate visual quality and are relatively unobstructed. Looking northwest from the southeast corner of the proposed TRR facility location (Figure 30-2R), the 31-acre Colusa Generating Station is visible in the background approximately 2.5 miles away. There are public views of the facility location from adjacent residences, McDermott Road on the east, and Lenahan Road on the southeast. Utilitarian features in the middleground and background include electric distribution lines and poles, high-voltage lattice transmission structures, and fences. There are no State-designated scenic highways near or with views of the proposed TRR, pipeline alignment, and auxiliary facilities (Caltrans, 2012). Existing sources of light and glare include existing residences, the Colusa Generating Station, and vehicles traveling on the existing agricultural access roads.

Delevan Pipeline and Delevan Transmission Line

For all three alternatives, the proposed Delevan Transmission Line would be aligned east from the Sites Pumping/Generating Plant to the existing PG&E or WAPA transmission line. This segment of the Delevan Transmission Line would cross rolling rangeland transitioning into flat agricultural land. For Alternatives A and C, the Delevan Transmission Line would continue from the PG&E or WAPA transmission line for approximately 10 miles east to the proposed Delevan Pipeline Intake Facilities along the Sacramento River. For all three alternatives, the Delevan Pipeline would be aligned from the proposed Holthouse Spillway and Stilling Basin and parallel the TRR Pipeline east to the TRR Pumping/Generating Plant. The Delevan Pipeline would then parallel the Delevan Transmission Line route to the Sacramento River. The eastern segments of the transmission line and pipeline would traverse flat agricultural land interspersed with county roads, rural residences, farms, and industrial land uses; I-5, Old Highway 99W, SR 45, and railroad tracks. The proposed alignment would be located approximately 200 yards north of the boundary of the Delevan National Wildlife Refuge. The proposed pipeline and transmission line alignment is of moderate visual quality and sensitivity, due to the presence of primarily rural and agricultural land uses that are representative of the region. Several viewer types have views of the pipeline and transmission line alignment. Motorists traveling southbound on I-5, Old Highway 99W, SR 45, and county roads would have very brief views of the alignment, and motorists traveling westbound on Delevan Road and Lenahan Road would have views of moderate duration, and area residents and recreational users of the Delevan National Wildlife Refuge could have views of extended duration. There are no State-designated scenic highways near or with views of the proposed facilities (Caltrans, 2012). Existing sources of light and glare include vehicles on county roads, Old Highway 99W, SR 45, I-5, residences, and agricultural facilities. The alignment for the proposed Delevan Pipeline and Transmission Line facilities is shown in Figures 30-2S and 30-2T.

Delevan Pipeline Intake/Discharge Facilities

The Delevan Pipeline Intake Facilities and Delevan Pipeline Discharge Facility would be located on the western riverbank of the Sacramento River, downstream from the existing Maxwell Irrigation District Pumping Plant. The existing pumping plant is a large industrial facility that is of low visual quality. The surrounding visual setting is characterized by the Sacramento River and the associated riparian habitat along its levees. The Sacramento River and its generally undeveloped riverbanks are considered a scenic resource, and are of moderate to high visual quality because the river is lined by a variety of sandy shorelines, riparian vegetation, steep rocky riverbanks, and levees. There are no State-designated scenic highways near or with views of the proposed facility location and there are no existing sources of light or glare (Caltrans, 2012). Views of Sacramento River from the west are obstructed by the levee. Access to the Project facility location is restricted to Maxwell Irrigation District employees only, and views from the east are limited to recreationists and agricultural landowners. Therefore, visual sensitivity is low and views are generally brief. The proposed location of the Delevan Pipeline Intake/Discharge Facilities is shown in Figure 30-2U.

Project Buffer

The Project Buffer would surround all of the Primary Study Area Project facilities, except for the Delevan Pipeline and Transmission Line, TRR Pipeline and Road, Delevan Pipeline Electrical Switchyard, TRR to Funks Creek Pipeline, and portions of the other Project roads. The existing visual setting within a given area of the Project Buffer would, therefore, be the same as that described for the Project facilities that would be located within that area.

30.3 Environmental Impacts/Environmental Consequences

30.3.1 Regulatory Setting

Visual resources are regulated at the federal, State, and local levels. Provided below is a list of the applicable regulations. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

30.3.1.1 Federal Plans, Policies, and Regulations

- National Scenic Byways Program

30.3.1.2 State Plans, Policies, and Regulations

- Delta Protection Act of 1992
- California Department of Transportation State Scenic Highway Program

30.3.1.3 Regional and Local Plans, Policies, and Regulations

- Tehama County General Plan
- Glenn County General Plan
- Colusa County General Plan

30.3.2 Evaluation Criteria and Significance Thresholds

Significance criteria represent the environmental thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* suggests the following evaluation criteria for aesthetics:

Would the Project:

- Have a substantial adverse effect on a scenic vista?
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?
- Substantially degrade the existing visual character or quality of the site and its surroundings?
- Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

The evaluation criteria used for this impact analysis represent a combination of the Appendix G criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- A substantial adverse effect on a scenic vista.
- Substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway.
- Substantial degradation of the existing visual character or quality of the site and its surroundings.
- A new source of substantial light or glare which would adversely affect day or nighttime views in the area.

30.3.3 Impact Assessment Assumptions and Methodology

30.3.3.1 Assumptions

The following assumptions were made regarding Project-related construction, operation, and maintenance impacts to visual resources:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.

- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge facilities would be required.
- Construction activities are anticipated to occur between the hours of 6:00 a.m. and 7:00 p.m. Monday through Friday. Nighttime and weekend construction are not planned, but may occur on an as-needed basis.

30.3.3.2 Methodology

The visual resources assessment is a multistep process, including:

- Defining baseline visual resources by:
  - Determining the visual environment of the Extended, Secondary, and Primary study areas
  - Characterizing the visual resources within the three study areas
  - Identifying viewer groups, viewpoints, exposures, sensitivities, and anticipated responses to those resources
- Describing the visual change that is expected from Project construction and operation
- Determining the degree of visual impact by considering:
  - The consistency of the visual changes from the Project with the Tehama, Glenn, and Colusa county general plans
  - The compatibility of the visual changes from the Project with the nearby landscape; whether the Project would substantially degrade the existing visual quality of the Project facility sites or their surrounding landscapes
  - The number of people who would have views of the proposed facilities, their typical sensitivity to landscape change, and the duration of their views
  - Whether a scenic vista, scenic highway, or a scenic resource would be affected
  - Whether Project facilities would introduce a new source of substantial light or glare which would adversely affect day or nighttime views in the area
- Developing mitigation for significant or potentially significant identified impacts on visual resources

The degree of visual impact depends on how perceptible the adverse change is. The perception of a visual impact is a function of the Project features, context, and viewing conditions (angle, distance, and typical viewing direction). The visual impact levels used in this analysis indicate the relative degree of change to the landscape that each alternative would create by considering visual sensitivity, visual contrast, project dominance, view impairment, and consistency with county General Plan policies.

Visual Sensitivity

The quality of the visual experience depends on the visual resources and the viewer response to those resources. When characterizing visual sensitivity, the following must be considered: the type of viewer group; the viewer exposure (their location, number of people in group, and duration and frequency of their view); and viewer profile (viewer activity, awareness, and values). For each of the viewer groups identified in the Project area, viewer exposure conditions were determined based on knowledge of the Project facility areas, review of aerial imagery, and site visits.

Visual Contrast

Visual contrast is a measure of the degree of change in line, form, color, and texture[2] that the Project would create, when compared to the Existing Conditions. Visual contrast ranges from “none” to “high”, and is defined as:

- *None* – The element contrast is not visible or perceived
- *Low* – The element contrast can be seen but does not attract attention
- *Moderate* – The element contrast begins to attract attention and dominate the characteristic landscape
- *High* – The element contrast attracts the viewer’s attention and cannot be overlooked

Project Dominance

Visual dominance is a measure of the Project feature’s perceived size relative to other visible landscape features in the viewshed. A Project facility’s dominance is determined by its relative location in the viewshed and the distance between the viewer and facility. The level of dominance can range from subordinate to dominant.

View Impairment

View impairment or blockage is a measure of the degree to which Project facilities would obstruct or block views to scenic resources due to the Project’s position and/or scale. Blockage of scenic resources or views can cause adverse impacts, especially in instances where scenic resources are essential to the use, value, or function of the land use.

Determination of Impact Significance

The determination of impact significance is based on combined factors of Visual Sensitivity and the Degree of Visual Change that the Project would cause. The relationship between these two overall factors in determining whether adverse visual impacts would be significant is shown in Table 30-2.

[2] The *form* of an object is its visual mass, bulk, or shape. *Line* is introduced by the edges of objects or parts of objects. The *color* of an object is both its value or reflective brightness (light, dark) and its hue (red, green). *Texture* is apparent surface coarseness (FHWA, 1988).

Table 30-2
Visual Impact Significance Summary

Visual Sensitivity	Visual Change: Low	Low to Moderate	Moderate	Moderate to High	High
Low	Less than Significant	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Low to Moderate	Less than Significant	Less than Significant	Less than Significant	Less than Significant	Potentially Significant
Moderate	Less than Significant	Less than Significant	Less than Significant	Potentially Significant	Potentially Significant
Moderate to High	Less than Significant	Less than Significant	Potentially Significant	Potentially Significant	Significant
High	Less than Significant	Potentially Significant	Potentially Significant	Significant	Significant

Notes:

Less than Significant impacts are perceived as negative but are considered minor in the context of existing landscape characteristics, and view opportunity.

Potentially Significant impacts are perceived as negative and may exceed environmental thresholds depending on Project- and site-specific circumstances. Impacts may be reduced to less than significant with implementation of mitigation.

Significant impacts may or may not be reduced to less-than-significant levels with implementation of feasible mitigation, and could exceed environmental thresholds.

Adapted from Reclamation, CCWD, and WAPA, 2009.

30.3.4 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

30.3.5 Impacts Associated with the No Project/No Action Alternative

30.3.5.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Agricultural Water Use, Municipal and Industrial Water Use, Wildlife Refuge Water Use, San Luis Reservoir, and Other Reservoirs

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to visual resources has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on visual resources, when compared to Existing Conditions.

Population growth is expected to occur in California throughout the period of Project analysis (i.e., 100 years), and is included in the assumptions for the No Project/No Action Alternative. A larger population could be expected to result in more municipal and industrial development throughout the three study areas, resulting in landscape changes to the study areas. The projects that are included in the No Project/No Action Alternative would already have been in place for most of the Project analysis period; as a result, the future population that chooses to relocate near the projects included in the No Project/No Action Alternative would not experience new visual resource impacts. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Historically, agricultural, municipal (including recreational water use at the reservoirs in the Extended Study Area), and industrial water use depends on several natural and human-induced variables. This trend is expected to occur into the future. The annual and seasonal variation in water use is typical and gradual, and is not expected to substantially impact visual resources. Therefore, **there would not be a substantial adverse effect,** when compared to Existing Conditions.

Due to the commitments set forth in the Central Valley Project Improvement Act (CVPIA), water deliveries to the Wildlife Refuges are expected to remain as-is in most cases if the No Project/No Action Alternative is implemented. Therefore, **there would not be a substantial adverse effect**, and there may be a **potentially beneficial effect,** on overall visual resources within the wildlife refuges, when compared to Existing Conditions, because a stable water supply would support existing wetland habitat.

No new sources of light would be introduced in the Wildlife Refuges as a result of potential changes in wildlife refuge water usage. Increased water supply to the refuges would increase the potential for daytime glare from water surface areas. However, this potential increase would be marginal and not readily noticeable to recreationists using the refuges. Therefore, **there would not be a substantial adverse effect** on day or nighttime views in the area, when compared to Existing Conditions.

Project operational modeling for Existing Conditions at the San Luis Reservoir indicates that drawdown would vary less in summer months than observed historically due to the implementation of agency programs and management plans that would cause a reduction in exports, allocation, or peak diversion rates. Water levels for the No Project/No Action Alternative would be higher than for Existing Conditions due to recent drawdown reductions and would be less variable than recorded historically. Therefore, **there would not be a substantial adverse effect**, and there may be a **potentially beneficial effect,** on scenic vistas from the No Project/No Action Alternative, when compared to Existing Conditions, because the reservoir would, on average, maintain higher water levels, which would help to preserve or improve its high scenic quality.

No new sources of light would be introduced at San Luis Reservoir. A more stable water level in the reservoir may increase the potential for daytime glare from the water surface while reducing potential glare from exposed rock and barren shoreline during summer months. However, these changes would not be readily noticeable to recreationists using the San Luis Reservoir Recreation Area. Therefore, **there would not be substantial adverse effect** on daytime views in the area, when compared to Existing Conditions.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

30.3.5.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for visual resources impacts has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect** on visual resources, when compared to Existing Conditions.

These Secondary Study Area waterbodies are operated pursuant to the same statutory regulations for both the No Project/No Action Alternative and Existing Conditions. In addition, the Secondary Study Area has historically experienced a wide range of reservoir storage levels and diversion rates, making it relatively complex to model future conditions.

Flows within the Sacramento River and through the Sacramento-San Joaquin Delta are highly regulated and are influenced by several factors: runoff from precipitation and snowmelt; natural variation; upstream water storage facilities; water diversions for agricultural, municipal, and industrial purposes; agricultural and municipal discharges; and a flood damage reduction system that includes levees, floodplains (the Yolo, Sutter, and Colusa bypasses), and weirs. Sacramento River and Delta flows vary substantially on a seasonal and annual basis. Seasonally, flows in the river may vary as a result of runoff from local tributaries and releases from the major water storage reservoirs, as well as diversions by agricultural, municipal, and other users. From year to year, river flows vary according to precipitation, the volume of carryover storage in reservoirs, and releases to downstream water users (SWRCB and CalEPA, 2010).

Although the above-listed reservoirs and rivers may experience marginal changes in reservoir storage levels and river flow rates as a result of implementation of projects and programs included in the No Project/No Action Alternative, they would not fall outside of the historical ranges of operation, and would, therefore, not visibly impact aesthetic resources. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Folsom Lake and Lake Natoma are the smallest of the upstream reservoirs in the Secondary Study Area. Significant urban development and population growth is predicted in the American River Basin through 2050 (DOF, 2007). Full urban contract deliveries to meet this need would cause a reduction in Folsom Lake storage levels if the No Project/No Action Alternative is implemented. Increased reservoir drawdown would have the potential to adversely impact visual resources at Folsom Lake by exposing wide portions of barren shoreline during the summer months and dry years. The No Project/No Action Alternative, therefore, **would have a potentially substantial adverse effect** on scenic vistas at Folsom Lake and Lake Natoma, when compared to Existing Conditions.

The Suisun, San Pablo, and San Francisco bays are large regional systems that do not respond dynamically to changes in flow due to the implementation of individual projects or management programs. No changes to visual resources are, therefore, expected if the No Project/No Action Alternative is implemented. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

SR 160 is a national and State-Designated Scenic Highway with extensive views along the Sacramento River and Sacramento-San Joaquin Delta (Caltrans, 2012). However, potential changes to flows in the Sacramento River and Delta if the No Project/No Action Alternative is implemented would not fall outside of historical operational ranges, and therefore, would not adversely impact visual resources. Except for the Sacramento River and Sacramento-San Joaquin Delta, there are no designated scenic highways in the vicinity of the reservoirs and rivers in the Secondary Study Area. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

No new sources of light would be introduced at the Secondary Study Area facilities if the No Project/No Action Alternative is implemented. Unstable and decreased water levels in the reservoirs may decrease the potential for daytime glare from water surface areas while increasing potential glare from exposed rock and barren shoreline during summer months. However, these changes would be gradual and would not be easily noticeable to recreationists visiting the recreation areas. Therefore, **there would not be a substantial adverse effect** on daytime views within the Secondary Study Area from implementation of the No Project/No Action Alternative, when compared to Existing Conditions.

30.3.5.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, and Maintenance Impacts

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

The No Project/No Action Alternative assumes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to visual resources has been addressed in those environmental documents. Projects included in the No Project/No Action Alternative are not located within the Primary Study Area; therefore, **there would not be a substantial adverse effect** on visual resources in that study area, when compared to

Existing Conditions. In addition, the Project would not be constructed if this alternative is implemented; therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. In addition, projects considered within the No Project/No Action Alternative are not located within the viewshed of a State-designated scenic highway, and would, therefore, have **no impact** on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

30.3.6 Impacts Associated with Alternative A

30.3.6.1 Extended Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Agricultural, Municipal, and Industrial Water Use

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There would be no direct Project-related construction or maintenance activities in the Extended Study Area; therefore, Alternative A would have **no impact** on visual resources in this area, when compared to Existing Conditions and the No Project/No Action Alternative. Proposed Project operational activities would result in improvement in surface water supply reliability for agricultural, municipal, and industrial users. It is improbable that improved water supply reliability would induce or change substantial agricultural land use changes or municipal and industrial water consumption patterns to the degree that would impact visual resources in the Extended Study Area. There would, therefore, be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

Wildlife Refuge Water Use

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

No direct Project-related construction or maintenance activities would occur in the Extended Study Area. The wildlife refuges that would receive Level 4 water supplies would receive the same amount of supply with implementation of Alternative A as with the No Project/No Action Alternative; however, the source of a portion of the supply would change.

Refer to the **Impact Vis-1** discussion for the No Project/No Action Alternative. There would be no adverse effect, resulting in **no impact** (and a **potentially beneficial effect**) from Alternative A, when compared to Existing Conditions.

When compared to the No Project/No Action Alternative, implementation of Alternative A would result in **no impact** because the wildlife refuge water use would remain the same.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

San Luis Reservoir

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

No direct Project-related construction or maintenance activities would occur in the Extended Study Area. Direct Project-related operational effects at San Luis Reservoir would, however, result if Alternative A is implemented. San Luis Reservoir is a reregulating reservoir used to regulate distribution and meet delivery commitments to SWP and CVP contractors and is not intended for long-term storage. Drawdown of San Luis Reservoir is projected to increase with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative; however, projected levels would not be outside of the historical range. This would, therefore, be a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. State Designated Scenic Highway 152 follows the northern shore of San Luis Reservoir for approximately six miles. However, because projected reservoir water levels with implementation of Alternative A would remain within the historical range, there would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

No direct Project-related construction or maintenance activities would occur in the Extended Study Area, resulting in no new sources of artificial light. Project effects on San Luis Reservoir operation would not require the installation of new sources of artificial light. Decreased water levels in the reservoir would decrease the potential for glare from water surface areas and increase the potential for glare from the bare exposed shorelines. However, the potential change in water levels would be within the historical range, and would not be easily noticeable to recreationists. This would be considered a **less-than-significant** impact on day or nighttime views in the area, when compared to Existing Conditions and the No Project/No Action Alternative.

Other Reservoirs

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

No direct Project-related construction or maintenance activities would occur in the Extended Study Area. All other reservoirs on the California Aqueduct are operated in a narrow range to reregulate the flows in the canals and to provide emergency storage if there is a failure in the conveyance system. These reservoirs are not operated in response to allocations or San Luis Reservoir operating conditions. There would, therefore, be **no impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

30.3.6.2 Secondary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Trinity Lake, Lewiston Lake, Trinity River, Klamath River Downstream of the Trinity River, Whiskeytown Lake, Spring Creek, Shasta Lake, Sacramento River, Keswick Reservoir, Clear Creek, Lake Oroville, Thermalito Complex (Thermalito Diversion Pool, Thermalito Forebay, and Thermalito Afterbay), Feather River, Sutter Bypass, Yolo Bypass, Folsom Lake, Lake Natoma, American River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

No direct Project-related construction or maintenance activities would occur in the Secondary Study Area waterbodies listed above. Implementation of Alternative A would result in increased storage within the reservoirs of the Secondary Study Area, particularly in Critical and Dry years. Operationally, Alternative A would also result in a general increase and stabilization in flows within rivers and creeks within the Secondary Study Area. The overall increase in flows and storage, however, would not be outside of the historical range for the system, and would, therefore, not be visibly obvious to residents, recreationists, or motorists in the vicinity of these waterbodies. There would, therefore, be **no impact** (and **potentially beneficial effect)**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on scenic resources.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to effects on the existing visual character of a site and its surroundings.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. That discussion is also applicable to sources of light or glare.

Pump Installation at the Red Bluff Pumping Plant

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

The only direct Project-related construction that would occur in the Secondary Study Area is related to the installation of an additional pump at the RBPP. The existing visual character of the Sacramento River at the RBPP appears industrially developed. The construction of an additional pump within an existing concrete bay, followed by its operation and maintenance, would not substantially degrade the visual character of the area, nor impair the existing viewshed around the RBPP. Additionally, although the

Tehama County General Plan considers the Sacramento River to be a scenic resource, the pump installation and operation would be consistent with General Plan Policy OS-11.4 which states that "new development should be designed to be compatible with surrounding development in ways that contribute to the desired character of the surrounding area," (Tehama County, 2009).There would, therefore, be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the GCID Canal Intake and the Red Bluff Pumping Plant. The existing visual character would not be degraded by increasing the frequency and intensity of dredging at the RBPP nor are there any designated scenic vistas in the vicinity of the facility. The existing visual character at the GCID Canal Facilities is highly developed, and maintenance activities in and around the facility are common. Increasing the frequency or intensity of dredging at the GCID Canal Intake would not substantially degrade the existing visual quality of the site, nor adversely affect a scenic vista. Additionally, there are no Glenn County General Plan policies which would be relevant to the maintenance of the GCID Canal Intake. There would, therefore, be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-1** discussion. There are no State scenic highways within the vicinity of the RBPP or GCID Canal Intake; therefore, there would be no impact to scenic resources within a State scenic highway at these locations. In the greater Sacramento River region, there would be also be **no impact** (and **potentially beneficial effect**), when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. There would be **no impact** (and **potentially beneficial effect**), when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. In addition, pump installation at the RBPP would be consistent with Tehama County General Plan Policy OS-11.4a which states that "new development shall include provisions for the design of outdoor light fixtures to be directed/shielded downward and screened to avoid adverse night-time lighting spill-over effects on adjacent land uses and night-time sky glow conditions," (Tehama County, 2009). There would be **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

30.3.6.3 Primary Study Area – Alternative A

Construction, Operation, and Maintenance Impacts

Sites Reservoir Inundation Area

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County or Glenn County; therefore the proposed Sites Reservoir would be consistent with the Colusa County 2030 General Plan and the Glenn County General Plan (Colusa County, 2012; Glenn County, 1993). The existing Antelope Valley (Sites Reservoir Inundation Area) is of high visual quality due to its many panoramic landscapes of open, hilly grasslands and oak woodlands from existing roads and residences. Construction of Alternative A would require the demolition of all structures within the proposed inundation area, including houses, barns, sheds, shops, and others auxiliary structures. Additionally, vegetation removal activities would degrade existing scenic views of the valley floor. Although Project-related changes to the landscape could become less visible over time, there would be brief views of these modifications during construction by motorists on portions of Lurline Road and Huffmaster Road, which would provide detoured vehicle access between Maxwell and Lodoga during construction. During the construction of Sites Reservoir, the area is expected to be of moderate visual quality despite the removal of trees and other vegetation, the presence of construction equipment, and the potential for fugitive dust generation, because the remaining open grasslands would remain largely intact.

The initial filling of the reservoir would occur over several years, during which time the area would transition from open grasslands to deepening wetlands which may attract birds and other regional riparian species. During this time, the inundation area would be of moderate to high visual quality. The construction and initial filling of Sites Reservoir would be considered a temporary impact, and would, therefore, have a **less-than-significant impact** on scenic vistas within the site, when compared to Existing Conditions and the No Project/No Action Alternative.

Upon completion of the initial filling of the reservoir, the full Sites Reservoir would convey the aesthetic of a large natural lake during Normal to Wet years. The operational reservoir inundation area during this time would be unique and visually dominant due to largely uninterrupted views of the waterbody and surrounding vegetated hillsides. During Dry years and in some summer months, the reservoir water supply would be drawn down to meet Project purposes. During periods of substantial drawdown, the shores and reaches of the inundation area would be unvegetated. The area would be visible by motorists from the proposed South Bridge and relocated road system, and by recreationists at the proposed recreation areas located around the reservoir, resulting in moderate to high visual sensitivity. If Alternative A is implemented, visual change would be high because the Sites Reservoir Inundation Area would be of high visual contrast, when compared to Existing Conditions. During Normal to Wet years, the reservoir would, however, also be of high visual quality due to its distinctive nature and visibility to a greater number of motorists and recreationists, when compared to Existing Conditions. Scenic views of the upland areas would be maintained, and new scenic views across the expansive reservoir would be created. During Dry to Critical years and some late summer months, the existing visual character of the area would temporarily deteriorate to a low to moderate visual quality. If Dry to Critical conditions were to last for several years, there is the potential for substantial degradation of the existing visual quality. Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, there would be a **potentially significant impact**.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

No State-designated scenic highways are aligned near or through the Sites Reservoir Inundation Area. When compared to Existing Conditions and the No Project/No Action Alternative, there would, therefore, be **no impact** from construction, operation, and maintenance of Alternative A.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. Colusa County 2030 General Plan Policy CC 1-15 requires that the rural landscape be preserved and enhanced as an important scenic feature of the County. In addition, Policy OSR 1-5 states that "new development should be designed and constructed to preserve open space features such as scenic corridors, wetlands, riparian vegetation, native vegetation, trees and natural resource areas where feasible and appropriate," (Colusa County, 2012). Glenn County General Plan Policy NRP-16 also requires that grazing land be retained in large contiguous areas of the foothills (Glenn County, 1993). The proposed Sites Reservoir would impact grazing land and many open space features, and therefore, would be inconsistent with General Plan policies of Colusa and Glenn counties. When compared to Existing Conditions and the No Project/No Action Alternative, there would be a **potentially significant impact**.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Construction of Sites Reservoir would create new temporary sources of reflective daytime and nighttime glare. Construction activities would include the removal of all human-made structures and trees from the proposed inundation area. Areas of exposed earth would create potential sources of daytime glare prior to the filling of the reservoir. Construction equipment and workers' vehicles could also be a temporary source of reflective daytime glare. Colusa County 2030 General Plan Policy OSR 1-14 requires that development "Reduce light and glare from artificial lighting within open space and agricultural areas to the extent that it does not adversely impact the County's rural character," (Colusa County, 2012). Additionally, Glenn County General Plan Policy NRP-86 requires projects to "avoid light and glare impacts when considering development," (Glenn County, 1993). Construction activities during early morning and evening hours could require the use of construction lighting at individual Project facility work sites in areas that previously had no source of artificial lighting. Therefore, conditions during construction may be inconsistent with the General Plans of Colusa and Glenn counties. However, no sensitive receptors (residents and recreationists) would have views of the construction sites, and motorists would have only brief views of some of the construction areas from Lurline Road and Huffmaster Road in the southern portion of the inundation area. In addition, construction activities would be temporary. Therefore, new sources of light or glare due to Project construction would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The permanent conversion of a vegetated landscape to a 1.27-MAF reservoir would introduce a substantial new potential source of daytime and nighttime glare in the area. In addition, new sources of light and glare would result from the introduction of recreational boat use in the reservoir. When compared to Existing Conditions and the No Project/No Action Alternative, due to the permanent new source of glare created by the reservoir, this impact is considered **potentially significant**.

Sites Reservoir Dams

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore, the proposed Sites Reservoir Dams would be consistent with the Colusa County 2030 General Plan and the Glenn County General Plan. Construction of the nine dams proposed as part of Alternative A would require the removal of vegetation and several large rock formations, which would degrade existing scenic views of the hilly grassland and rocky outcrops. These changes would be visible during construction; however, public views of the dam locations during construction would be partially obstructed by the terrain and limited to motorists along Eastside Road, which would not be included in the detour route for Maxwell Sites Road and Sites Lodoga Road. The construction of the dams would occur over several years, during which time the visual character is expected to be of low visual quality due to the presence of construction equipment and materials, and the removal of vegetation within the dam footprints. The dam construction would be considered a temporary impact, and would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The proposed dams would be constructed as earthfill embankment dams, and are designed to be constructed primarily of excavated on-site soil and rock. Although the dams would be large features, the use of largely on-site earthen materials for the proposed dams would generate low visual contrast for viewers while in operation and cause them to be visually subordinate to the proposed reservoir and its surroundings. Additionally, views of the proposed dams would be largely obstructed due to the area terrain and limited in duration to motorists on the relocated roads. The overall visual change would be low to moderate, and visual sensitivity would be low. Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, construction and operation of the proposed dams would result in a **less-than-significant impact**.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to Sites Reservoir Dams.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. In addition, the proposed Sites Reservoir Dams would be consistent with Colusa County General Plan Policy OSR 1-5 as supported by the **Impact Vis-1** discussion. There are no Glenn County General Plan policies which would be relevant to the construction, operation, or maintenance of the Sites Reservoir Dams. Therefore, there would be **a less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

The construction of Golden Gate Dam, Sites Dam, and seven saddle dams would create new temporary and permanent sources of reflective daytime glare and nighttime lighting. Building materials used to construct the dams may have the potential to be reflective under natural and artificial light. Construction equipment and vehicles could also be a temporary source of reflective daytime glare.

Construction activities during early morning and evening hours would require the use of lighting at Project work sites for several years. In addition, operation and maintenance of the dams may require new sources of permanent safety lighting. Views of the proposed dams and their associated operations and maintenance activities would, however, be largely obstructed due to the area terrain and limited in duration to motorists on the relocated roads. The proposed dams would not require the installation of highly visible artificial lighting, and therefore, would be consistent with Colusa County General Plan Policy OSR 1-14 and Glenn County General Plan Policy NRP-86. Overall visual change would be moderate; however, because visual sensitivity would be low, the impact of new sources of light and glare is considered a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Recreation Areas

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County or Glenn County; therefore, the proposed Recreation Areas would be consistent with the Colusa County 2030 General Plan and Glenn County General Plan. Construction of the proposed Recreation Areas would require grading and the removal of some vegetation for the construction of roads and facilities such as the restrooms, campsites, and picnic areas. However, construction would not be intensive because the natural character of the recreation areas would be generally maintained. These changes would be visible during construction; however, public views of the recreation area locations during construction would be partially obstructed by the terrain and limited to motorists along the proposed detour route. The construction of the recreation areas would occur over several years, during which time the visual character is expected to be of moderate visual quality due to the presence of construction equipment and materials within the proposed recreation areas footprints. Construction of the recreation areas would be considered a temporary impact, and would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the proposed Recreation Areas would offer new recreation opportunities in scenic lakeside and island settings consistent with the Colusa County General Plan, and create viewing opportunities that do not currently exist. During Above Normal and Wet years, the aesthetic quality of the proposed Sites Reservoir and its surroundings would be high and result in a **beneficial effect** to scenic resources due to increased access to high quality views. During Dry to Critical years, drawdown of the reservoir could begin in early spring and continue through late summer. During this substantial reservoir drawdown, the shores along the proposed reservoir would be unvegetated, and temporarily degraded to a lower visual quality, but no change to the visual quality of the recreation areas would occur. Although the visual sensitivity of visiting recreationists would be moderate to high, the overall visual change would be low. Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, this would result in a **less-than-significant impact**.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Recreation Areas.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. In addition, the proposed Recreation Areas would be consistent with Colusa County 2030 General Plan Policy CC 1-15 and Glenn County General Plan Policy NRP-16. Therefore, when compared to Existing Conditions and the No Project/No Action Alternative, this would result in a **less-than-significant impact**.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

The construction up to five Recreation Areas would create new temporary sources of reflective daytime and nighttime glare. Recreational facility structures, roadways, and roadway fixtures, such as safety barriers, have the potential to be reflective under natural and artificial light. Construction equipment and workers' vehicles could also be a temporary source of reflective daytime glare. Construction activities during early morning and evening hours would require the use of lighting. Construction lighting would be temporary, and therefore, would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative. New sources of permanent nighttime lighting would be required for safety purposes in the recreational areas. In addition, new sources of light and glare would be introduced by operations and maintenance vehicles, recreationists' vehicles, boats, and campfires in the recreation areas. Therefore, operation of the proposed Recreation Areas has the potential to be inconsistent with Colusa County 2030 General Plan Policy OSR 1-14 and Glenn County General Plan Policy NRP-86. When compared to Existing Conditions and the No Project/No Action Alternative, this impact is considered **potentially significant.**

Road Relocations and South Bridge

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County or Glenn County; therefore, the proposed Road Relocations and South Bridge would be consistent with the Colusa County 2030 General Plan and Glenn County General Plan. Alternative A would require the construction of approximately 44 miles of new public access roads, and improvements to several existing paved and gravel roads. The construction of new roads and improvement of existing roads, and the maintenance of Project roads would temporarily degrade the scenic views from and visual character of the area due to the presence of construction equipment and workers, removal of vegetation, and generation of dust. During operation, views of the new roadways would generally be seen at a shallow viewing angle, and would appear similar to other county roads in the region, and therefore would be of low visual contrast. The road relocations would neither permanently block nor impair views of surrounding landscape, and would generally be visible only by motorists using these roads. Construction of the proposed relocated roads, road improvements, and the presence of the roads would not degrade any existing scenic vistas from or near the area. Visual sensitivity of motorists using the new roads would be low and the visual change would also be low, therefore, the proposed road relocations would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Construction of the bridge would occur over several years, during which time the visual character of the area would be temporarily degraded due to the presence of construction equipment, materials and workers, removal of vegetation, and generation of dust within the Project footprint. These changes would be visible during construction; however, public views of the bridge alignment during construction would be obstructed by the terrain. Operation and maintenance activities would include inspections and repairs, and would occur periodically throughout the life of the Project. They would typically be activities of short duration, requiring few vehicles, equipment, and personnel. Both bridge construction and its operation and maintenance would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative

Once operating, the South Bridge would be approximately 1.5 miles long and its deck would be 45 feet above the reservoir's maximum water surface elevation. The bridge would be visually dominant and create moderate to high visual contrast to viewers (relative to viewpoint) due to its form (height and massing), the introduction of a new line to the landscape, and a change in the landscape's texture and color from Existing Conditions. The South Bridge would also introduce urban infrastructure in an area that is largely characterized by its rural and undeveloped open space. This may cause it to be perceived as lacking harmony and cohesiveness within both the existing setting as well as alongside other Project facilities included in Alternative A. The South Bridge would be visible by recreationists from the proposed Stone Corral Recreation Area, who may have a high visual sensitivity to such infrastructure within a natural landscape. Introduction of the proposed South Bridge would create a significant visual change in a location with the potential for moderate to high visual sensitivity. This would, therefore, result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Road Relocations and South Bridge.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. Colusa County 2030 General Plan Policy CIRC 1-8 requires that transportation facilities are planned and designed to "avoid damage to the County's scenic and environmental resources, such as reductions in air quality and disruption of soils, topography, vegetative cover, and wildlife habitat," (Colusa County, 2012). Although new roads would be constructed to be aesthetically similar to existing County roads, the proposed Road Relocations and South Bridge would require permanent vegetation removal and would, therefore, be inconsistent with the Colusa County General Plan. In addition, North Road and Eastside Road would be constructed within Glenn County and would potentially be inconsistent with Glenn County General Plan Policy NRP-16, which involves retaining grazing land in large contiguous areas of the foothills (Glenn County, 1993). This would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-4** discussion for the Site Reservoir Inundation Area construction impacts.

During operations, vehicles traveling on the South Bridge and relocated roads would create a new source of daytime glare and nighttime lighting in the area. In addition, guardrails and other roadway fixtures, such as retaining walls, safety barriers, light standards, and other structures, have the potential to be reflective under natural and artificial light. Therefore, operation of the proposed Road Relocations and South Bridge has the potential to be inconsistent with Colusa County 2030 General Plan Policy OSR 1-14 and Glenn County General Plan NRP-86. When compared to Existing Conditions and the No Project/No Action Alternative, this impact is considered **potentially significant**.

Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Holthouse Reservoir Complex, and Holthouse Reservoir Electrical Switchyard

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore, these proposed facilities would be consistent with the Colusa County 2030 General Plan. Construction of Alternative A would require the demolition of all structures within the footprint and buffer of the proposed facilities, including a shed and a barn. During construction, these facility locations would be concentrated in an area that would prohibit public access, and therefore, eliminate public views by motorists and residents. Residents located along Maxwell Sites Road, Delevan Road, Sutton Road, and McDermott Road would see a large number of construction vehicles driving within their viewsheds during the construction phase of these Project facilities; however, the vehicles and equipment used may be similar to those used in the transport of agricultural goods along the same roads. Construction of these facilities would not substantially affect a scenic vista, and would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative

During Project operations and maintenance, several of these facilities would be underground or underwater features (including the Site Reservoir Inlet/Outlet Structure and all tunnels and pipelines), and therefore, not visible. There would be limited views of the Holthouse Reservoir by motorists on Eastside Road; however viewers may perceive this water feature as having high visual quality. Motorists along Eastside Road would experience brief views of the Field Office Maintenance Yard and Sites Electrical Switchyard; however; these types of structures are characteristic of this agricultural region. Although the construction of a new reservoir complex and several new buildings would be a moderate visual change, the extent of visibility of these Project facilities is minimal; therefore, visual sensitivity is considered low. Operation of these facilities would not affect a scenic vista, resulting in a **less-than-significant impact** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Sites Pumping/Generating Plant, Sites Electrical Switchyard, Field Office Maintenance Yard, Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure, Sites Reservoir Inlet/Outlet Structure, Holthouse Reservoir Complex, and Holthouse Reservoir Electrical Switchyard.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. In addition, Colusa County 2030 General Plan Policy CC 1-16 requires "all new development to protect the scenic beauty of the County, incorporate high quality site design, architecture, and planning so as to enhance the overall quality of the built environment in the County's communities and create a visually interesting and aesthetically pleasing built environment that respects the rural nature of the County," (Colusa County, 2012). Therefore, construction and operation of the Field Office Maintenance Yard, Sites Electrical Switchyard, and Holthouse Reservoir Electrical Switchyard have the potential to be inconsistent with the General Plan. This would, therefore, result in a **potentially significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Construction of the Project facilities listed above would create new temporary sources of reflective daytime glare and nighttime lighting. Building materials used to construct the Sites Pumping/Generating Plant, Field Office Maintenance Yard, Sites Electrical Switchyard, and Holthouse Reservoir Electrical Switchyard may have the potential to be reflective under natural and artificial light. Construction equipment and vehicles could also be a temporary source of reflective daytime glare and nighttime light. Construction activities during early morning and evening hours would require the use of vehicle and perimeter lighting. However, construction lighting would be temporary, and would therefore, result in a **less-than-significant impact,** when compared to Existing Conditions and the No Project/No Action Alternative

Operation and maintenance of the facilities would also require new sources of permanent access and safety lighting. Therefore, operation of the proposed facilities could potentially be inconsistent with General Plan Policy OSR 1-14. As discussed in **Impact Vis-1**, views of the facility locations would be largely obstructed due to terrain and lack of public access. Visual change in sources of light and glare would be high; however, because visual sensitivity would be low, the impact on day and nighttime views in the area is considered a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Terminal Regulating Reservoir, Terminal Regulating Reservoir Pumping/Generating Plant, Terminal Regulating Reservoir Electrical Switchyard, Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, Delevan Pipeline Electrical Switchyard, and Glenn-Colusa Irrigation District Canal Connection to the Terminal Regulating Reservoir

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore, the proposed TRR and its associated facilities listed above would be consistent with the Colusa County 2030 General Plan. During construction of the TRR and its associated facilities, views from adjacent residents and roads of scenic undeveloped hills to the west would have the potential to be temporarily impaired by construction equipment, vehicles, workers, and materials. Residents located along Maxwell Sites Road, Delevan Road, Sutton Road, and McDermott Road would see a large number of construction vehicles driving within their viewsheds during the construction phase of these Project facilities; however, some of the vehicles and equipment used may be similar to those used in the transport of agricultural goods along the same roads. Construction of the TRR and its associated facilities would be considered a temporary activity, and would, therefore, have a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

The TRR and its associated facilities would be developed on the valley floor adjacent to the GCID Canal using a combination of excavation and embankment. The proposed reservoir embankments would be approximately six feet above the existing ground surface, which would make the TRR and its associated facilities, with the exception of the TRR Pipeline and TRR Pipeline Road, visually dominant in the landscape due to the minimal topographic variation and absence of large water features within this area, resulting in a moderate to high visual change. Views from adjacent residents and roads of scenic undeveloped hills to the west would have the limited potential to be obstructed during operations depending on their distance from the proposed facilities and viewing angle, resulting in moderate visual sensitivity. Operation and maintenance of these facilities would, therefore, result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the TRR and its associated facilities.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Construction of the TRR, its associated facilities, and the GCID Canal Connection to it would create temporary changes in the views of and from the Project area. Construction activities would introduce heavy equipment and associated vehicles, including cranes, scrapers, excavators, and graders, into the viewshed of residents and motorists near the Project work site. However, the proposed location for the TRR and its associated facilities is currently subject to the continual presence of tractors, trucks, and other equipment used in agriculture, although of differing types and intensity, so viewers may not be sensitive to the presence of construction equipment. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The proposed TRR and its associated facilities would cover approximately 200 acres of existing agricultural land, creating a moderate to high visual contrast, when compared to Existing Conditions. The new waterbody would be perceived as distinct to the area, which is characterized by agricultural fields, rural residences, and several small water storage facilities and water conveyance systems, due to its scale and designed height of approximately six feet above the existing ground level. The presence of the proposed TRR, its associated facilities (with the exception of the TRR Pipeline and TRR Pipeline Road), and the GCID Canal Connection and its operation and maintenance would, therefore, have the potential to degrade its moderate visual quality due to a substantial and distinct change from its existing use. The proposed TRR and its associated facilities (with the exception of the TRR Pipeline and TRR Pipeline Road) would also be inconsistent with Colusa County 2030 General Plan Policy OSR 1-12, which requires that visually intrusive development near scenic resources be limited in order to minimize visual impacts to the greatest extent feasible (Colusa County, 2012). This would, therefore, result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Construction of the TRR, its associated facilities, and the GCID Canal Connection would introduce new temporary sources of reflective daytime glare and nighttime lighting. Construction equipment and vehicles could be a temporary source of reflective daytime glare. In addition, materials that would be used to construct the TRR Pumping/Generating Plant, TRR Electrical Switchyard, and Delevan Pipeline Electrical Switchyard may have the potential to be reflective under natural and artificial light. Construction activities during early morning and evening hours would require the use of lighting. This impact on daytime and nighttime views is considered **potentially significant** due to the proximity of the nearby residences, when compared to Existing Conditions and the No Project/No Action Alternative.

Approximately 200 acres of agricultural land would be permanently converted to a regulating reservoir. This would expose area residents to a substantial new potential source of daytime and nighttime glare due to the reservoir's designed-embankment height of six feet. The reservoir would also create a potential source of glare to aircraft flying over the new reservoir, similar to what occurs when they pass over existing reservoirs. In addition, operation and maintenance of the facilities would require new sources of permanent access and safety lighting. Therefore, operation of the proposed TRR and its associated facilities has the potential to be inconsistent with General Plan Policy OSR 1-14. The visual change in sources of light and glare would be moderate to high, and visual sensitivity would be moderate to high due to the number of residents located in the vicinity of the proposed facilities. This impact is considered **potentially significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Transmission Line

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore the proposed Delevan Transmission Line would be consistent with the Colusa County 2030 General Plan. Construction of the Delevan Transmission Line would be moderately to highly visible by motorists and residents at approximately 30 residences within one mile of the proposed alignment due to lack of topography and mature vegetation along the alignment. Construction of the Transmission Line would create temporary changes in the views of and from the construction work site. Construction activities would introduce heavy equipment and associated vehicles into the viewshed of the proposed transmission line alignment. However, the area is currently subject to the continual presence of large agricultural equipment, although of differing types and intensity. Construction of the Delevan Transmission Line would, therefore, result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The proposed Transmission Line would not likely substantially impair views or visually dominate the viewshed due to the wide spacing and massing of the towers. In addition, views of the open agricultural land are fairly homogenous and several existing transmission lines already traverse the area. The Transmission Line would be aligned approximately 200 yards north of the northern boundary of the Delevan National Wildlife Refuge; however, public views both of and from the refuge on the north are obstructed by mature trees demarking the refuge boundary. The Transmission Line would terminate near the western bank of the Sacramento River, at the Delevan Pipeline Intake Facility. The Transmission Line would not be visible from the Sacramento River because views from the river to the west are blocked by the levee system and orchards. Operation and maintenance activities would consist of periodic inspections of the Transmission Line and towers by inspectors via truck, and repairs, as necessary. Transmission Line operation and maintenance activities would be visible by motorists and residents within one mile of the proposed alignment causing moderate to high sensitivity; however, due to the expected periodic timing and short duration at any given tower, this would be considered a low to moderate visual change. There would, therefore, be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Transmission Line.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion for the Delevan Transmission Line. There are several existing transmission lines and towers that traverse the flat agricultural land of Colusa County; therefore, a new transmission line would be compatible with the existing landscape, and would generate a low to moderate visual change. Visual sensitivity of residents and motorists would be moderate. Colusa County 2030 General Plan Policy CON 2-14 states that "Any proposed pipeline or transmission line within the county shall be aligned so that interference with agriculture is minimized," (Colusa County, 2012). The Delevan Transmission Line would be aligned above agricultural land, and its permanent impact would be limited to the transmission towers, which would not degrade a substantial portion of agricultural acreage. Therefore, the alignment of the proposed Delevan Transmission Line would be consistent with the Colusa County General Plan, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Construction of the Delevan Transmission Line would introduce new temporary sources of reflective daytime glare and nighttime lighting. Construction equipment and vehicles could be a temporary source of reflective daytime glare. Materials used to construct the transmission towers and line may have the potential to be reflective under natural and artificial light. Construction activities during early morning and evening hours would require the use of lighting. These activities and equipment would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Operation and maintenance of the proposed Transmission Line may require permanent safety lighting. Therefore, operation of the proposed Delevan Transmission Line could potentially be inconsistent with General Plan Policy OSR 1-14. However, visual change in sources of light and glare would be low to moderate due to the spacing of the transmission towers and would depend on viewing angle and distance, and visual sensitivity would be moderate due to the number of residents and motorists in the vicinity of the proposed facilities. This would be a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

Refer to the **Impact Vis-1** discussion for construction impacts of the Delevan Transmission Line. The Delevan Pipeline would follow the same alignment and fall within the same construction disturbance area as the proposed Transmission Line from the Delevan Pipeline Intake Facilities to the TRR. From the

TRR to Holthouse Reservoir, the three-mile-long pipeline would diverge from the proposed Transmission Line alignment; however, the existing affected environment for both alignments between the TRR and the Holthouse Reservoir Complex is similar. Therefore, construction impacts would be similar.

Operation and maintenance of the Delevan Pipeline would not affect existing views of or from the Pipeline alignment because the pipeline would be installed underground. Above-ground structures associated with the Pipeline include blow-off structures, air valve structures, and outlet and energy dissipater structures. These installed structures would be spaced at intervals along the proposed Pipeline, and would be visually subordinate to the existing surrounding agricultural land uses. Operations and maintenance activities would consist of periodic inspections and repairs of the Pipeline and above-ground structures that would require the use of vehicles. These activities and the presence of the above-ground pipeline structures would not affect a scenic vista. Therefore, operations and maintenance of the Delevan Pipeline would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Pipeline.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Agricultural land and open space are considered to be a scenic area according to the Colusa County 2030 General Plan. The alignment of the proposed Delevan Pipeline through existing agricultural land uses may be inconsistent with General Plan Policy CON 2-14, which states that “Any proposed pipeline or transmission line within the county shall be aligned so that interference with agriculture is minimized” (Colusa County, 2012). Therefore, construction of the Delevan Pipeline would result in a **potentially significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Refer to the **Impact Vis-1** discussion for operation and maintenance of the Delevan Pipeline. Following Project completion, the disturbed agricultural land used for temporary construction staging would be restored to pre-Project conditions, as feasible, which would be consistent with Colusa County General Plan policy. This would, therefore, result in a **less-than-significant impact** on the existing visual quality of the agricultural surroundings, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-4** discussion for construction impacts of the Delevan Transmission Line. The Pipeline would not require installation of structures that would permanently emit light or glare. Therefore, operation of the proposed Delevan Pipeline would be consistent with General Plan Policy OSR 1-14, and construction, operation, and maintenance of the Delevan Pipeline would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Delevan Pipeline Intake Facilities

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore the proposed Delevan Pipeline Intake Facilities would be consistent with the Colusa County 2030 General Plan. The Delevan Pipeline would terminate at the Sacramento River, adjacent to the existing Maxwell Irrigation District Pumping Plant (a large industrial facility that results in the area being of low to moderate visual quality). Construction of the proposed Delevan Pipeline Intake Facilities would introduce heavy equipment and vehicles, as well as construction workers, into the area.

Although much of the Sacramento River is generally considered to be a scenic vista, public views of the proposed Delevan Pipeline Intake Facilities during operation and maintenance would be obstructed on the west by the levee and privately owned orchards. On the east side of the river, public views would be obstructed by stands of mature trees and vegetation, beyond which is private agricultural development; in addition, public access to the east river bank is not legally permitted in the vicinity of the proposed facility location. Public views of the proposed facilities would be available from the river. The Delevan Pipeline Intake Facilities would result in a moderate visual change from the existing undeveloped riverbank. Despite the moderate to high visual quality of the area surrounding the existing pumping plant, the visual sensitivity would be low to moderate due to the lack of visibility of the facility location from land, the lack of public access in the vicinity of the proposed facilities, and the expected few viewers of the facilities from the river. This would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

Refer to the **Impact Vis-2** discussion for the Sites Reservoir Inundation Area. That discussion is also applicable to the Delevan Pipeline Intake Facilities.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Refer to the **Impact Vis-1** discussion. In addition, the proposed Delevan Pipeline Intake Facilities would be consistent with Colusa County 2030 General Plan Policy OSR 1-12 requiring that visual intrusive development near scenic resources be limited to minimize visual impacts. The facilities would be consistent with the policy due to the lack of public access in the vicinity of the proposed facilities, and the expected few viewers of the facilities from the river.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Refer to the **Impact Vis-1** discussion. Construction of the Delevan Pipeline Intake Facilities would introduce new temporary sources of reflective daytime glare and nighttime lighting. Construction equipment and vehicles could be a temporary source of reflective daytime glare. Materials used to construct the fish screen and pumping/generating plant may have the potential to be reflective under natural and artificial light. Construction activities during early morning and evening hours would require the use of lighting.

Operation and maintenance of the facilities may require new sources of permanent safety lighting. Therefore, operation of the proposed Delevan Pipeline Intake Facilities has the potential to be inconsistent with General Plan Policy OSR 1-14. The visual change in sources of light and glare would be moderate; however, viewer sensitivity would be low due to limited public views of the proposed facility location. Therefore, the impact on day and nighttime views in the area is considered **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Project Buffer

Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista

There are no officially designated scenic vista points in Colusa County; therefore, the presence of the Project Buffer would be consistent with the Colusa County 2030 General Plan.

Construction of the Project Buffer would include demolition of existing structures, removal of vegetation to create a fuel break, and construction of a fence. The activities would require on-site equipment of varying sizes. The fence would consist of standard three-strand barbed wire fences with posts along the Project Buffer boundary where fences do not already exist. Equipment that would be used for structures and vegetation removal and installing fences to delineate between Project parcels and adjacent non-Project parcels are both typical for the Project's rural setting. These construction and demolition activities would be a temporary impact. Therefore, construction and demolition activities for the Project Buffer fence would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

No Project facilities are proposed to be located within the Project Buffer. The only Project operation and maintenance activities that would occur within the Project Buffer would be fence maintenance and periodic boundary fuel break construction and maintenance. In addition, public access would be prohibited. The fence would create a line across the landscape, but would be in character with existing fences in the area (i.e., having three-strand barbed wire strung on wooden posts). Although the visual sensitivity along the Project Buffer boundary ranges from low to high, the fence installation and periodic fuel break maintenance would be considered a low visual change. Therefore, the presence of the fence and the operation/maintenance activities that would occur within the Project Buffer would result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-2: Substantial Damage to Scenic Resources, Including, but not Limited to, Trees, Rock Outcroppings, and Historic Buildings within a State Scenic Highway

No Project facilities would be located within a State Scenic Highway, so the Project Buffer and its associated fuel break maintenance activities and fence would also not be located within such a designated corridor, nor would it affect scenic resources within such a corridor. Therefore, construction, operation, and maintenance of the Project Buffer would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings

Construction of Alternative A would require the removal of vegetation to create a fuel break, the demolition of several structures that are located within the Project Buffer but outside of the associated Project facility footprints, and the installation of a fence. Structures include houses, barns, shops, and sheds adjacent to the proposed Sites Reservoir Inundation Area. These construction and demolition activities would introduce construction vehicles and workers into the landscape around each of the Project facilities. These activities would last only a short time, and while at each Project facility, it would not substantially degrade the visual character or quality of that area, resulting in a **less-than-significant impact**, when compared to Existing Conditions or the No Project/No Action Alternative.

The presence of the Project Buffer three-strand barbed wire fence and the periodic fuel break and fence maintenance that would occur within this area would not substantially degrade the visual character or quality of that area and would be consistent with General Plan policies of Colusa County and Glenn County, resulting in a **less-than-significant impact** during Project operation and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Vis-4: A New Source of Substantial Light or Glare which would Adversely Affect Day or Nighttime Views in the Area

Removal of vegetation to create a fuel break, the demolition of several structures, and fence construction could introduce daytime glare in the landscape from Project construction vehicles and/or equipment. This source of potential glare would be mobile, as activities progress around the Project facilities, and is not expected to be in any given location for an extended period of time. If these activities were to occur at night, construction lighting would be used, which could affect nighttime views in the area. Because potential light and glare impacts would be in any given location for only a short period of time and many of the Project facilities would be located in areas that are not readily visible to residents (and may be visible to motorists for only short periods of time), this is considered a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

The presence of the Project Buffer fence and the periodic fuel break and fence maintenance activities that would occur are not expected to emit glare during the daytime, and the fence would not be lit at night. Therefore, operation of the proposed Project Buffer would be consistent with the General Plan policies of Colusa County and Glenn County, and **no impact** would occur during Project operation and maintenance, when compared to Existing Conditions and the No Project/No Action Alternative.

30.3.7 Impacts Associated with Alternative B

30.3.7.1 Extended and Secondary Study Areas – Alternative B

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to scenic vistas (**Impact Vis-1**), scenic resources within a State Scenic Highway (**Impact Vis-2**), visual character or quality of a site and its surroundings (**Impact Vis-3**), and a new source of light or glare (**Impact Vis-4**) would be the same as described for Alternative A for the Extended and Secondary study areas.

30.3.7.2 Primary Study Area – Alternative B

Construction, Operation, and Maintenance Impacts

The following Project facilities are included in both Alternatives A and B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to visual resources:

- Recreation Areas
- Sites Pumping/Generating Plant

- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

If Alternative B is implemented, the footprints and construction disturbance areas of Sites Reservoir and Dams, the Road Relocations and South Bridge, and the Delevan Transmission Line would differ from Alternative A. If Alternative B is implemented, the Sites Reservoir Inundation Area would increase to a 1.81-MAF storage capacity. The boundary of the larger reservoir would range from less than 100 feet wider in some areas to several thousand feet larger in others, than that of the Alternative A reservoir, depending on the existing slope of the terrain. The 1.81-MAF reservoir proposed for Alternative B would necessitate the relocation and/or resizing of several Project features including the access roads, South Bridge, Golden Gate Dam, and Sites Dam, to accommodate an increased water elevation during Project operations. The larger reservoir would also require larger dams and two additional saddle dams. In addition, the Delevan Pipeline Intake Facilities would be replaced by the Delevan Pipeline Discharge Facility, which would be smaller, resulting in a reduced disturbance area. However, these differences in the size of the facility footprint, alignment, or construction disturbance area would not change the type of construction, operation, and maintenance activities that were described for Alternative A. They would, therefore, have the same impact on scenic vistas (**Impact Vis-1**), scenic resources within a State Scenic Highway (**Impact Vis-2**), visual character or quality of a site and its surroundings (**Impact Vis-3**), and a new source of light or glare (**Impact Vis-4**) as described for Alternative A.

The boundary of the Project Buffer would be the same for Alternatives A and B, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A. It would, therefore, have the same impact on scenic vistas (**Impact Vis-1**), scenic resources within a State Scenic Highway (**Impact Vis-2**), visual character or quality of a site and its surroundings (**Impact Vis-3**), and a new source of light or glare (**Impact Vis-4**) as described for Alternative A.

30.3.8 Impacts Associated with Alternative C

30.3.8.1 Extended and Secondary Study Areas – Alternative C

Construction, Operation, and Maintenance Impacts

The impacts associated with Alternative B, as they relate to scenic vistas (**Impact Vis-1**), scenic resources within a State Scenic Highway (**Impact Vis-2**), visual character or quality of a site and its surroundings (**Impact Vis-3**), and a new source of light or glare (**Impact Vis-4**) would be the same as described for Alternative A for the Extended and Secondary study areas.

30.3.8.2 Primary Study Area – Alternative C

Construction, Operation, and Maintenance Impacts

The following Primary Study Area Project facilities are included in Alternatives A, B, and C. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to visual resources:

- Recreation Areas
- Sites Pumping/Generating Plant
- Sites Electrical Switchyard
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure
- Sites Reservoir Inlet/Outlet Structure
- Field Office Maintenance Yard
- Holthouse Reservoir Complex
- Holthouse Reservoir Electrical Switchyard
- GCID Canal Facilities Modifications
- GCID Canal Connection to the TRR
- TRR
- TRR Pumping/Generating Plant
- TRR Electrical Switchyard
- TRR Pipeline
- TRR Pipeline Road
- Delevan Pipeline
- Delevan Pipeline Electrical Switchyard

The Alternative C design of the Delevan Transmission Line and Delevan Pipeline Intake Facilities is the same as described for Alternative A. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore, result in the same construction, operation, and maintenance impacts to visual resources as described for Alternative A.

The Alternative C design of the Sites Reservoir Inundation Area, Sites Reservoir Dams, and Road Relocations and South Bridge is the same as described for Alternative B. These facilities would require the same construction methods and operation and maintenance activities regardless of alternative, and would, therefore result in the same construction, operation, and maintenance impacts to visual resources as described for Alternative B.

The boundary of the Project Buffer would be the same for Alternatives A, B, and C, but because the footprints of some of the Project facilities that are surrounded by the Project Buffer would differ between the alternatives, the acreage of land within the Project Buffer would also differ. However, this difference in the size of the area included within the buffer would not change the type of construction, operation, and maintenance activities that were described for Alternative A.

30.4 Mitigation Measures

Mitigation measures are provided below and summarized in Table 30-3 for the impacts that have been identified as significant or potentially significant.

Table 30-3
Summary of Mitigation Measures for NODOS Project Impacts to Visual Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
Impact Vis-1: A Substantial Adverse Effect on a Scenic Vista	South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR	Potentially Significant	No Feasible Mitigation	Significant and Unavoidable
Impact Vis-3: Substantial Degradation of the Existing Visual Character or Quality of the Site and its Surroundings	Road Relocations & South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR; Delevan Pipeline (construction and maintenance)	Potentially Significant	Mitigation Measure Vis-3a: Reduce Construction and Maintenance Impacts Causing Adverse Temporary Impacts on Visual Quality of the Site	Less than Significant
	Sites Reservoir Inundation Area, Road Relocations & South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR (operation)	Potentially Significant	Mitigation Measure Vis-3b: Reduce Operational Impacts Causing Adverse Permanent Impacts on Visual Quality of the Site	Significant and Unavoidable

Table 30-3
Summary of Mitigation Measures for NODOS Project Impacts to Visual Resources

Impact	Associated Project Facility	LOS Before Mitigation	Mitigation Measure	LOS After Mitigation
	Field Office Maintenance Yard, Sites Electrical Switchyard, Holthouse Reservoir Electrical Switchyard (operation)	Potentially Significant	Mitigation Measure Vis-3b: Reduce Operational Impacts Causing Adverse Permanent Impacts on Visual Quality of the Site	Less than Significant
Impact Vis-4: Introduce a New Source of Substantial Light or Glare which Would Adversely Affect Day or Nighttime Views in the Area	Recreation Areas; South Bridge; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR; Delevan Transmission Line (construction and maintenance)	Potentially Significant	Mitigation Measure Vis-4a: Reduce Construction and Maintenance Impacts Causing Substantial Light or Glare	Less than Significant
	Recreation Areas; Road Relocations & South Bridge; TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR (operation)	Potentially Significant	Mitigation Measure Vis-4b: Reduce Operational Impacts Causing Substantial Light or Glare	Less than Significant
	Sites Reservoir Inundation Area (operation)	Potentially Significant	No Feasible Mitigation	Significant and Unavoidable

Note:
LOS = Level of Significance

Mitigation Measure Vis-3a: Reduce Construction and Maintenance Impacts Causing Adverse Temporary Impacts on Visual Quality of the Site

To minimize the temporary construction impacts on visual resources due to substantial degradation of existing visual quality from construction and maintenance of the Road Relocations, South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR, and Delevan Pipeline, DWR and Reclamation shall:

- Water areas where dust is generated, particularly along unpaved haul routes and during earth-moving activities, to reduce impacts to views and the landscape caused by dust.
- Prohibit unnecessary ground disturbance outside of the construction disturbance area.
- Revegetate and restore disturbed ground surfaces at each Project facility to their original condition to the extent feasible.

Mitigation Measure Vis-3b: Reduce Operational Impacts Causing Adverse Permanent Impacts on Visual Quality of the Site

To minimize permanent impacts on visual resources due to substantial degradation of existing visual quality from operation of the Road Relocations and South Bridge, Field Office Maintenance Yard, Sites Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR, and Holthouse Reservoir Electrical Switchyard, DWR and Reclamation shall:

- Use native trees, bushes, and shrubs for screening at the Project facilities that may substantially degrade the existing visual character of the site(s), in a manner that does not compromise facility safety and access.
- Incorporate high quality site design and architecture in order to create an aesthetically pleasing built environment that does not detract from the rural nature of the surroundings.
- Retaining walls and erosion control devices or structures shall be sited, designed, and constructed to avoid detracting from the scenic quality of the area.

Mitigation Measure Vis-4a: Reduce Construction and Maintenance Impacts Causing Substantial Light or Glare

To minimize impacts on day or nighttime views due to substantial light or glare expected from construction and maintenance of the Recreation Facilities, South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline Electrical Switchyard, GCID Canal Connection to the TRR, and Delevan Transmission Line, DWR and Reclamation shall:

- Minimize light scatter and glare from portable temporary light sources that would be used for nighttime construction by using shielded and directional lighting, and install temporary visual barriers, as needed, to prevent light spill from equipment lighting in areas with sensitive receptors.

- Design, construct, and finish all new buildings and structures using non-reflective materials, non-glare finishes, and colors that would blend with the natural environment and not create a new source of glare.
- Design the transmission line structures to be similar in appearance to the existing transmission lines in the Project vicinity to the extent feasible. Use non-specular conductors and non-reflective and non-refractive insulators.
- Use minimal Project construction signs; signs that would be installed shall be made of non-glare materials, finishes, and unobtrusive colors to the extent possible. The design of any signs required by safety regulations shall conform to the criteria established by those regulations.

Mitigation Measure Vis-4b: Reduce Operations Impacts Causing Substantial Light or Glare

To minimize impacts on day or nighttime views due to substantial light or glare expected during operation of the Recreation Facilities, Road Relocations and South Bridge, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, and GCID Canal Connection to the TRR, DWR and Reclamation shall:

- Use native trees, bushes, and shrubs for screening at Project facilities that may generate new sources of light or glare, in a manner that does not compromise facility safety and access.
- Minimize nighttime lighting to areas required for safety, security, and operations, and shield lighting from public view to the extent possible. Timers and sensors shall be used to minimize the amount of time that lights are on in areas where lighting is not normally needed for safety, security, or operation. Use shielded and directional permanent lighting.
- Use minimal Project signs; signs that would be installed shall be made of non-glare materials, finishes, and unobtrusive colors to the extent possible. The design of any signs required by safety regulations shall conform to the criteria established by those regulations.
- Design and install guardrails and other roadway fixtures, including retaining walls, safety barriers, light standards, and other structures to adequately provide for the safety of the motorist using non-glare materials, unobtrusive colors, and flat finishes to minimize potential glare.

Implementation of **Mitigation Measures Vis-3a, Vis-3b**, **Vis-4a**, and **Vis-4b** would reduce the level of significance of visual resource impacts from the following Project facilities to **less than significant**: Recreation Areas, Field Office Maintenance Yard, Sites Electrical Switchyard, TRR Pipeline, TRR Pipeline Road, Delevan Pipeline, and Delevan Transmission Line.

There is no feasible mitigation to reduce all impacts to visual resources from the following Project facilities to a less than significant level: Sites Reservoir Inundation Area, Road Relocations and South Bridge, Holthouse Reservoir Electrical Switchyard, TRR, TRR Pumping/Generating Plant, TRR Electrical Switchyard, Delevan Pipeline Electrical Switchyard, and GCID Canal Connection to the TRR. The impacts to visual resources at those locations would remain **significant and unavoidable**.

30.5 References

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Figures

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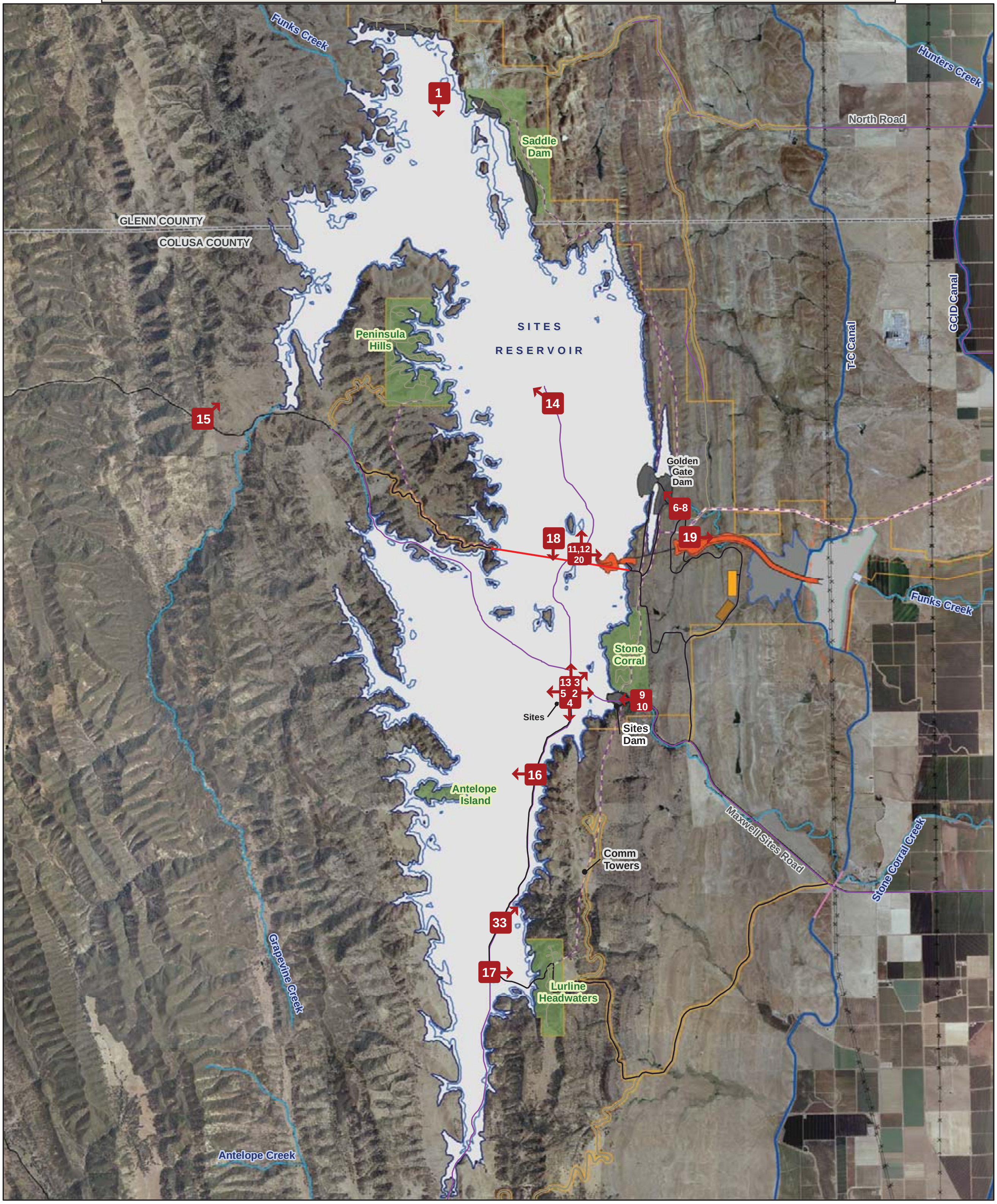

Legend

- 1 Photo # & Location w/ Aspect
- 1.27-MAF Reservoir
- 1.81-MAF Reservoir
- Dams
- Existing Funks Reservoir
- Holthouse Reservoir Complex
- Recreation Areas
- Inlet/Outlet Structure
- Asphalt Plant
- Field Office Maintenance Yard
- Construction Disturbance Area
- Transmission Line Easement
- Delevan Transmission Line
- Existing Transmission Line
- Delevan Pipeline
- TRR Pipeline
- Existing Access Roads

Proposed Project Roads

- Gravel
- Paved
- South Bridge

N

0 0.375 0.75 1.5 2.25 3 Miles

Notes: Aerial Imagery NAIP 2010.

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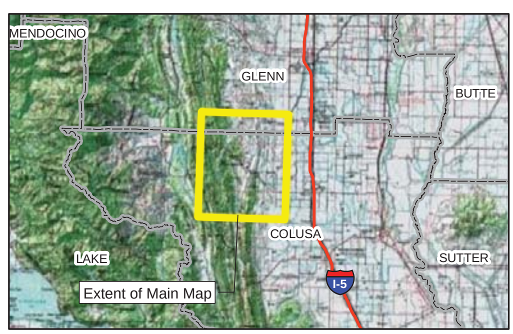

FIGURE 30-1A
Sites Reservoir
Photo Locations
North-of-the-Delta Offstream Storage Project

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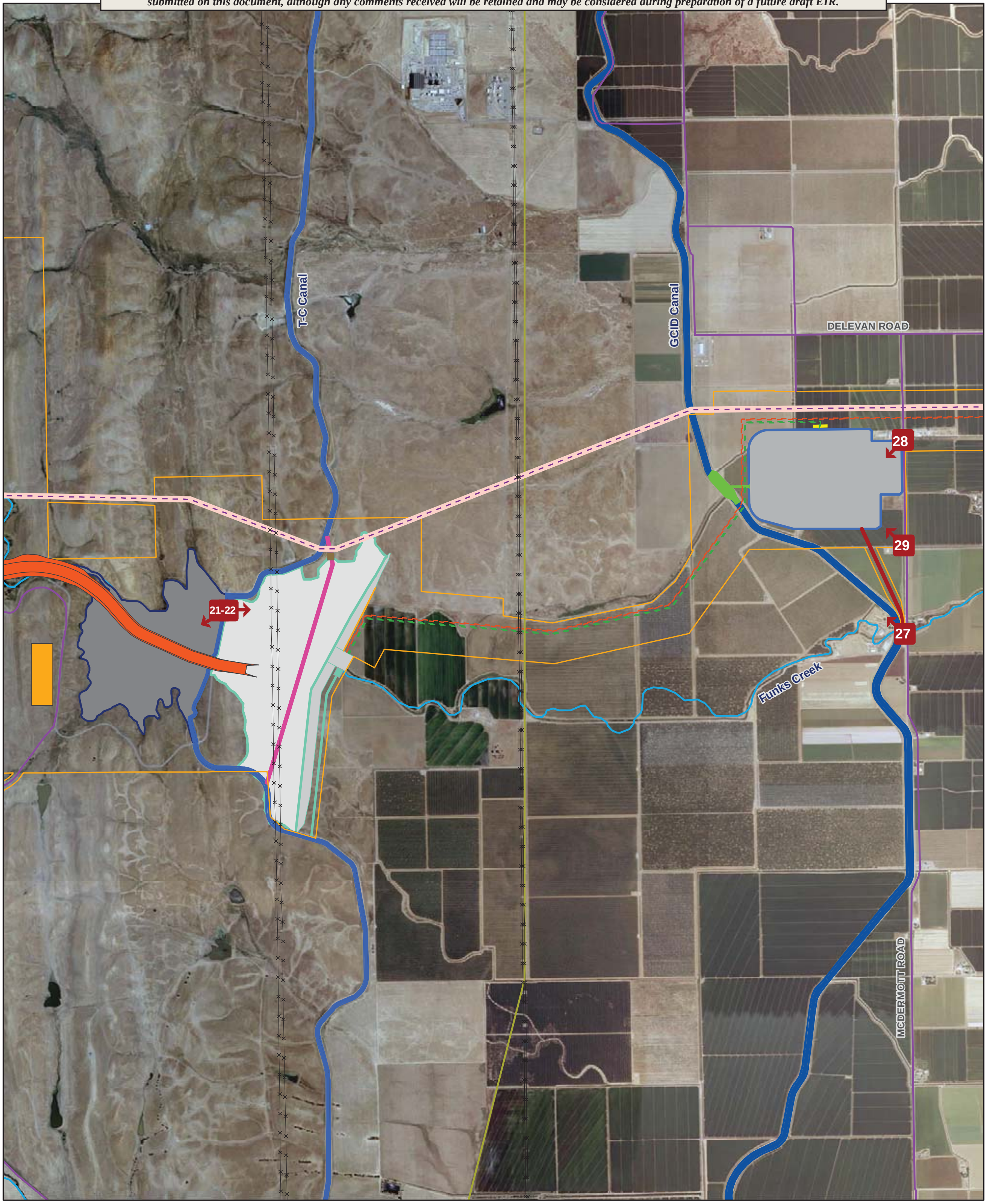
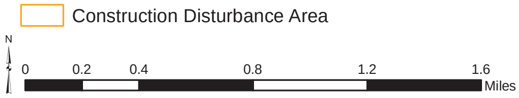


Legend

- 1 Photo # & Location w/ Aspect
- Inlet/Outlet Structure
- Field Office Maintenance Yard
- Existing Funks Reservoir
- Holthouse Reservoir Complex
- TRR
- TRR to GCID Connection
- TRR Pump Station
- Construction Disturbance Area
- Transmission Line Easement
- Delevan Transmission Line
- Delevan Pipeline
- TRR Pipeline
- TRR to Funks Creek Pipeline
- T-C Canal Bypass
- Existing Gas Line
- Existing Transmission Line
- Existing Access Roads



Notes: Aerial Imagery NAIP 2010.

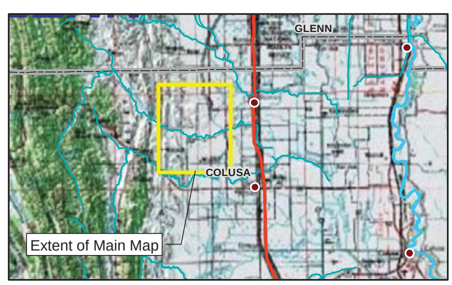


FIGURE 30-1B
Holthouse Reservoir Complex and TRR Complex Photo Locations
North-of-the-Delta Offstream Storage Project

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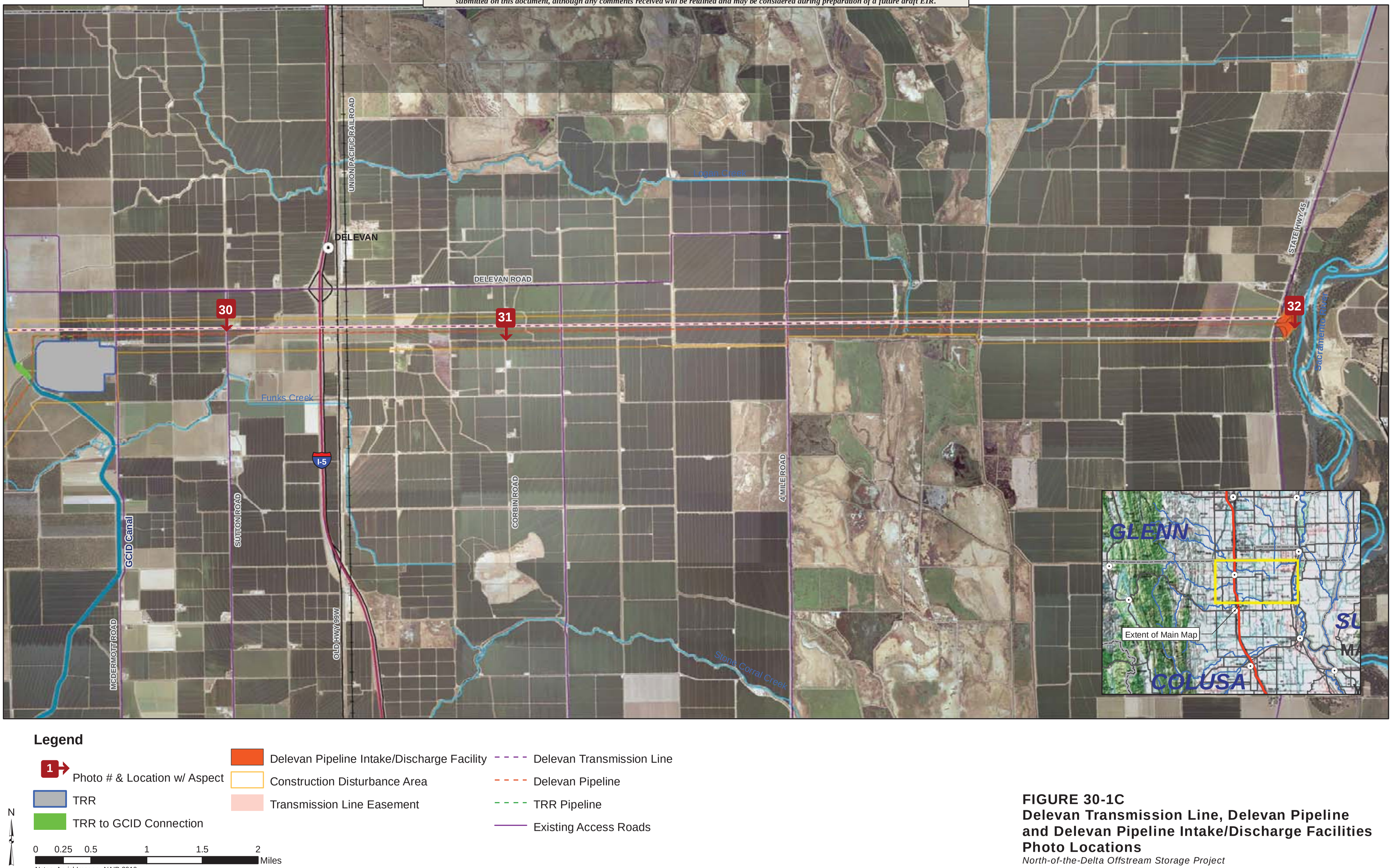

FIGURE 30-1C
Delevan Transmission Line, Delevan Pipeline and Delevan Pipeline Intake/Discharge Facilities Photo Locations
North-of-the-Delta Offstream Storage Project

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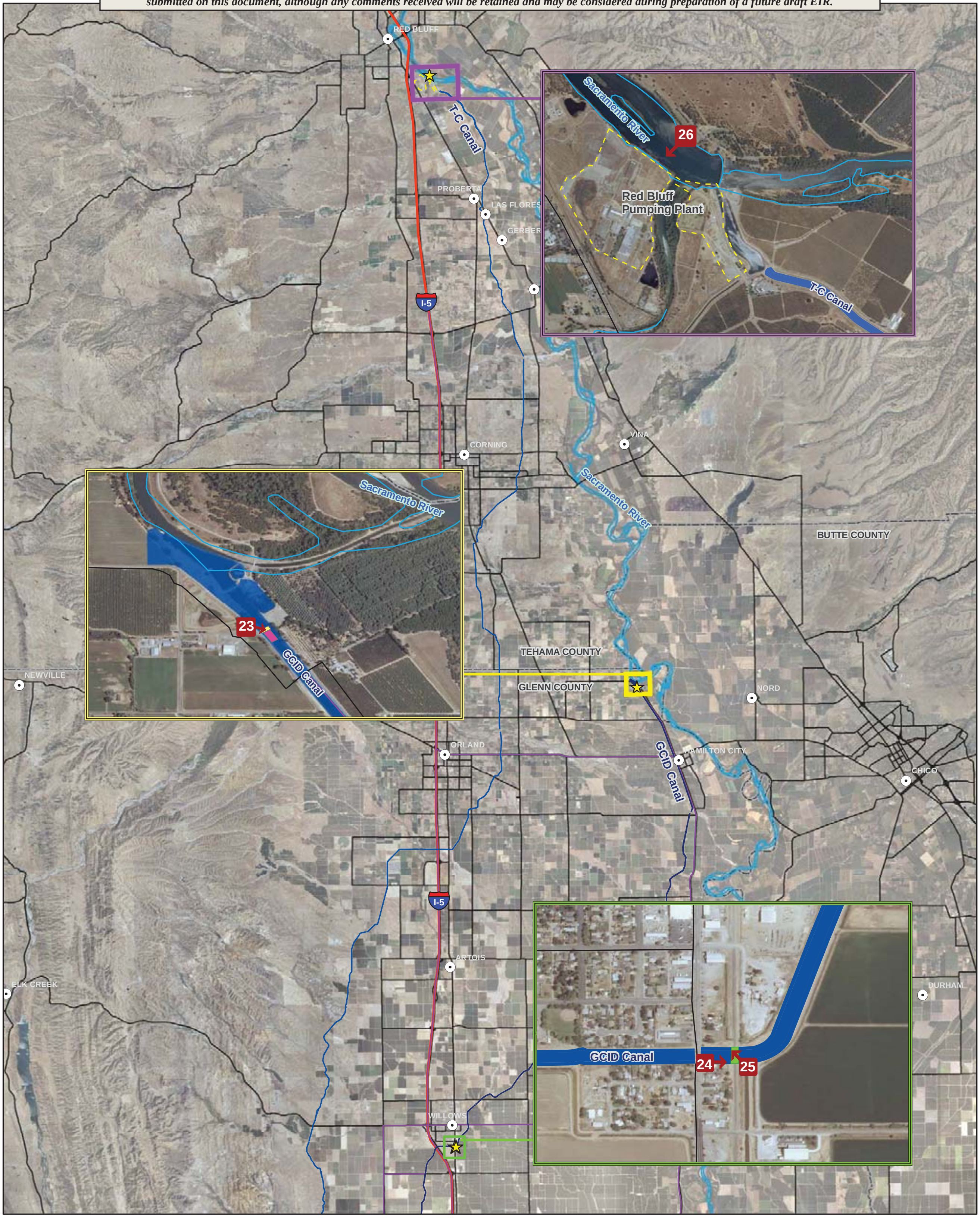
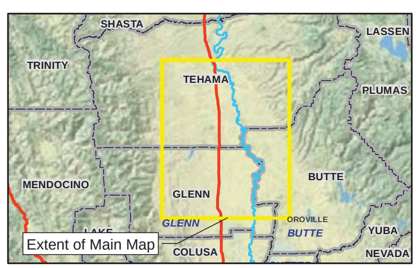


Legend

- Photo # & Location w/ Aspect
- Project Facility Locations
- Red Bluff Pumping Plant
- GCID Canal Lining
- GCID Headgate Structure
- GCID Railroad Siphon
- Existing Access Roads



N

0 1.5 3 6 9 12 Miles

Notes: Aerial Imagery NAIP 2010.

FIGURE 30-1D
RBPP and GCID Facilities Photo Locations
North-of-the-Delta Offstream Storage Project

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Photo 1: Looking south toward inundation area from atop a hill along the northern boundary of proposed Sites Reservoir. Saddle Dam Recreation Area would be located in the eastern foothills on the left of the photo.

FIGURE 30-2A
Northern Portion of Sites Reservoir Inundation Area and Saddle Dam Recreation Area Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 2: Looking east from Maxwell Sites Road at the T-intersection with Sites Lodoga Road and Huffmaster Road in the Town of Sites. This location is within the proposed Sites Reservoir Inundation Area.

Photo 3: Looking northeast from Maxwell Sites Road at the T-intersection with Sites Lodoga Road and Huffmaster Road in the Town of Sites. This location is within the proposed Sites Reservoir Inundation Area.

FIGURE 30-2B
Sites Reservoir Inundation Area
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 4: Looking south from Maxwell Sites Road at the T-intersection with Sites Lodoga Road and Huffmaster Road in the Town of Sites. This location is within the proposed Sites Reservoir Inundation Area.

Photo 5: Looking west from near the Maxwell Sites Road at the T-intersection with Sites Lodoga Road and Huffmaster Road in the Town of Sites. This location is within the proposed Sites Reservoir Inundation Area.

FIGURE 30-2C
Sites Reservoir Inundation Area
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 6: Looking northwest toward the Golden Gate Dam location from outside of the inundation area.

Photo 7: Looking northwest toward the Golden Gate Dam left abutment location.

FIGURE 30-2D
Golden Gate Dam
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 8: Looking northwest toward the Golden Gate Dam right abutment location from outside of the inundation area.

Photo 9: Looking west along Maxwell Sites Road toward the Sites Dam left abutment location, from outside of the inundation area.

FIGURE 30-2E
Golden Gate Dam and Sites Dam Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 10: Looking west along Maxwell Sites Road toward the Sites Dam right abutment location, from outside of the inundation area.

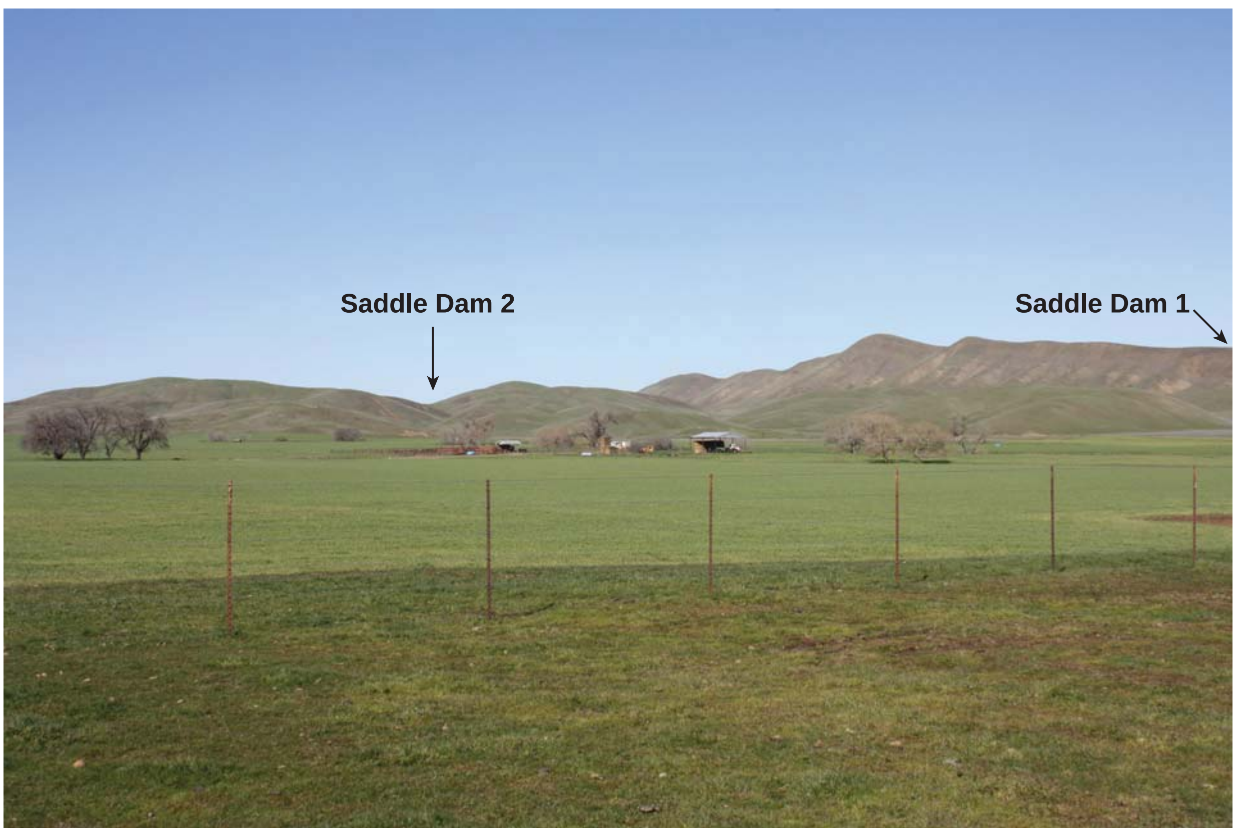

Photo 11: Looking north from Peterson Road toward Saddle Dams 1 and 2 locations from inside of the inundation area. Saddle Dam 1 would be located immediately adjacent to Logan Ridge on the right side of the photo. Saddle Dam 2 would be located to the left of center of the photo.

FIGURE 30-2F
Sites Dam and Saddle Dams 1 and 2 Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 12: Looking north from Peterson Road toward the Saddle Dam 3 location from inside of the inundation area (in the distant hills near the center of the photo).

FIGURE 30-2G
Saddle Dam 3
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 13: Looking northeast from intersection of Maxwell Sites Road and Sites Lodoga Road toward the Stone Corral Recreation Area location, from within the inundation area.

FIGURE 30-2H
Stone Corral Recreation Area
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 14: Looking northwest from within the Sites Reservoir Inundation Area toward the Peninsula Hills Recreation Area location.

FIGURE 30-2I
Peninsula Hills Recreation Area
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 15: Looking northeast from Sites Lodoga Road toward the Peninsula Hills Recreation Area location.

Photo 16: Looking west from Huffmaster Road toward the Antelope Island Recreation Area location.

FIGURE 30-2J
Peninsula Hills and Antelope Island Recreation Areas
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 17: Looking east from Huffmaster Road toward the Lurline Headwaters Recreation Area location.

Photo 18: Looking south from Peterson Road toward the South Bridge alignment from within the inundation area.

FIGURE 30-2K
Lurline Headwaters Recreation Area and South Bridge Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 19: Looking east toward the Sites Pumping/Generating Plant location, from outside the inundation area.

Photo 20: Looking east from Peterson Road (within the Sites Reservoir Inundation Area) toward Sites Reservoir Inlet/Outlet structure location.

FIGURE 30-2L
Sites Reservoir Pumping/Generating Plant and Inlet/Outlet Structure Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 21: Looking west at the existing Funks Reservoir toward the Field Office Maintenance Yard location (to the right of center of photo) from the downstream side of Funks Reservoir near Funks Creek and the Funks Dam Spillway.

FIGURE 30-2M
Field Office Maintenance Yard and Existing Funks Reservoir Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 22: Looking east at the Holthouse Reservoir location from the downstream side of Funks Reservoir near Funks Creek and the Funks Dam Spillway.

FIGURE 30-2N
Holthouse Reservoir Complex
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 23: Looking east and southeast toward the proposed GCID Canal Headgate Structure and Canal Lining location from the west side of the GCID Canal.

FIGURE 30-2O
Proposed GCID Canal Headgate Structure and Canal Lining Location Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 24: Looking east toward the proposed GCID Canal Railroad Siphon Replacement location from the east side of Tehama Street/Highway 99W atop the GCID Canal berm.

Photo 25: Looking west at the proposed GCID Canal Railroad Siphon Replacement location from the east side of the railroad tracks atop the GCID Canal berm.

FIGURE 30-2P
GCID Canal Railroad Siphon Replacement Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 26: Looking west from the east side of the Sacramento River at the Red Bluff Pumping Plant.

Photo 27: Looking northwest along the alignment of the TRR to Funks Creek Pipeline near the Outlet location at the Funks Creek crossing of McDermott Road.

FIGURE 30-2Q
Red Bluff Pumping Plant and TRR Facilities Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 28: Looking southwest from McDermott Road and the residences near the northeast corner of the TRR toward the TRR location.

Photo 29: Looking northwest from McDermott Road and Lenahan Road toward the TRR location.

FIGURE 30-2R
Terminal Regulating Reservoir
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 30: Looking south from Sutton Road approximately 0.25 mile south of Delevan Road toward the Delevan Transmission Line and Delevan Pipeline location.

FIGURE 30-2S
Delevan Transmission Line and Delevan Pipeline
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 31: Looking south from Corbin Road approximately 0.25 mile south of Delevan Road toward the Delevan Transmission Line and Delevan Pipeline location.

FIGURE 30-2T
Delevan Transmission Line and Delevan Pipeline
Landscape Character Photos
North-of-the-Delta Offstream Storage Project

Photo 32: Looking south (downstream) from the Maxwell Irrigation District facility on the west side of the Sacramento River toward the Delevan Pipeline Intake and Discharge Facilities location.

Photo 33: Looking northeast from Huffmaster Road toward the Communication Towers from within the inundation area.

FIGURE 30-2U
Delevan Pipeline Intake and Discharge Facilities and Communication Towers Landscape Character Photos
North-of-the-Delta Offstream Storage Project

31. Power Production and Energy

31.1 Introduction

This chapter describes the existing electrical generation and transmission infrastructure, the electricity market structure, the electricity demand forecast for California, and the potential effects of Project operations on future power production and use in the Primary, Secondary and Extended study areas. Descriptions and maps of these three study areas are provided in Chapter 1 Introduction.

The regulatory setting for power and energy is discussed briefly in this chapter, and is presented in greater detail in Chapter 4 Environmental Compliance and Permit Summary.

This chapter focuses on the potential impacts to electric power demand and production that could result from operation of the Project. Other energy uses for the Project, including diesel use by construction machinery and electricity use at the Project's recreation facilities, are also discussed. To the extent possible, these discussions are separated into the Extended, Secondary, and Primary study areas. However, due to the highly interconnected nature of the electric grid in the Western Interconnection (made up of all or parts of 14 states, two Canadian provinces, and part of Mexico), the effects of the Project on the delivery and use of electric power in that region are not necessarily limited to the defined geographic study areas, but rather can affect areas throughout the western U.S. Mitigation measures are provided in this EIR/EIS for identified significant or potentially significant impacts, and because no negative power production/use impacts were identified, no mitigation is included in this chapter.

31.2 Environmental Setting/Affected Environment

31.2.1 Extended Study Area

The Extended Study Area for this analysis includes all areas potentially affected by the changes to power grid operations caused by operation of the Project. The Project is located in northern California; therefore, the initial affected power system is comprised of primarily Pacific Gas & Electric (PG&E), Western Area Power Administration (WAPA), and Transmission Agency of Northern California (TANC) transmission systems, numerous generation facilities located in this area and the distribution systems of various entities interconnected to that portion of the Bulk Electric System (BES). The Extended Study Area also includes all or portions of 14 Western U.S. States, two Canadian Provinces, and the northern portion of Baja California Norte in Mexico that currently comprise the Western Interconnection. [1]

The Western Electricity Coordinating Council (WECC) is the Regional Entity responsible for coordinating and promoting BES reliability in the Western Interconnection. In addition, WECC provides an environment for coordinating the operating and planning activities of its members as set forth in the WECC Bylaws. The Balancing Authority (BA) is a key entity charged with complying with many of the reliability standards that WECC implements. The North American Electric Reliability Corporation (NERC) glossary of terms defines BA as the responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time. The California Independent System Operator (CAISO) is the largest BA in northern California. The Balancing Authority of Northern California (BANC) is an important municipal BA that

[1] The Western Interconnection is one of three synchronized interconnections in the United States where electricity can flow freely between various parts of the power system, only limited by transmission capacity and operational constraints.

includes WAPA as a sub BA. Both WECC and CAISO have ongoing efforts to plan for the reliable integration of significant amounts of intermittent renewable generation into the grid.

The states and provinces comprising WECC, along with the 2009 and projected 2020 electric energy demand of each state or province, are shown in Figure 31-1. The electric power grid in California is highly interconnected via high-voltage electric transmission lines with many WECC subregions. The grid is used to move power from a generator in one location to power users in another location; at any one time, millions of customers and hundreds of generators are using the grid for electricity service. The Western Interconnection offers many advantages, such as added system stability due to the inertia contributed by the hundreds of generators connected to the grid at any one time. System inertia is a product of the rotational velocity and mass of the rotors of all generators connected to the grid. The greater the system inertia, the greater ability the system has to mitigate disturbances to the grid, such as a generator shutting down unexpectedly. Some types of renewable generation such as solar photovoltaics do not use rotors to generate electricity and so do not provide inertia to the power system. The interconnected nature of the grid also adds stability due to its inherent tendency to cancel out load variability. For example, when one large load is started in one region, it is probable that the resultant instability put into the interconnected grid would be cancelled by the shutdown of one or more loads in another area. In addition, interconnected grids have the benefit of a more efficient bulk transfer of power and make it possible to serve load at the lowest available marginal cost of generation, provide supply reliability, and provide better outage management. The benefits provided by the interconnected grid have limits, however, especially as power flows on the grid reach maximum capacity and create congestion or bottlenecks that limit the ability to move power from one region to another.

The grid in the Western U.S. and Canada is highly interconnected north and south, such that hydroelectric generation in British Columbia can be delivered to California, and vice versa. Seasonal exchanges[2] without firm transmission rights were once common, but have been mostly crowded out of the market due to congestion in the electric transmission grid. This same congestion can also exacerbate the rare times when faults occurring in one area, such as the sudden loss of a generator or transmission line segment, ripple through vast areas of the West, creating widespread blackouts, such as a 1996 incident in which a downed transmission line in Montana led to a cascading outage across the western U.S., including large parts of California (Venkatasubramanian and Li, 1996), or a September 2011 incident in which a series of electrical faults in Arizona and Mexico led to a blackout for more than five million people in California (CEM, 2011). Interconnection to the eastern WECC subregions, as well as to other BAs in the U.S. and Canada, has always been limited by a relative lack of infrastructure, due to population trends and the difficulties and expense of constructing and maintaining electric transmission lines across the Rocky Mountains and other mountain ranges in the West.

Contractual agreements and electric reliability requirements guide the movement of power over the grid. Changes in supply and demand in any given time period can have both direct physical effects on the grid that can affect system reliability, and effects on the economics and contractual instruments that drive the use and operation of the grid. Short-term effects, such as a decrease in supply due to idling of a large power plant for maintenance, are reflected primarily in the cost of electricity, and in the cost of the fuels used to produce that electricity. Longer term effects, such as the introduction of a new large load, new generation, transmission or market products/design can all cause the need to upgrade the impacted system or region.

[2] Seasonal exchanges occur when winter-peaking utilities in the north send power south during the summer, and summer-peaking utilities in the south send power north during the winter.

31.2.2 Secondary Study Area

The Secondary Study Area includes the Balancing Authority Areas of CAISO and BANC from which Project-related transmission services, power sales, and purchases would occur.

31.2.2.1 Electrical Generation

California's electrical infrastructure is a complex grid of energy generation connected by high-voltage electric transmission lines and lower-voltage distribution lines. Table 31-1 shows the breakdown of sources for electric power consumption in the state in 2009 and 2010. California produces approximately 70 percent of its electricity from power plants within the State and from plants located outside the State but owned by California utilities. Approximately 30 percent of California's power supply is imported electricity from the Pacific Northwest and the American Southwest. In 2010, the total electricity imported was 92,130 gigawatt-hours (GWh), up slightly from 91,140 GWh in 2009. The 1,008 in-State power plants (greater than 0.1 megawatt [MW] each) totaled 69,709 MW in installed capacity and produced 205,695 GWh of electricity in 2009. Utilities in California own approximately 6,200 MW of capacity outside of the State, including all or portions of nuclear power plants in Arizona and coal-fired plants in Arizona, Nevada, New Mexico and Utah (CEC, 2011c). Both demand and total energy use in the State declined from 2009 to 2010, due to a generally cooler year and the downturn in the economy.

Table 31-1
2009 and 2010 Total System Power for California

Fuel Type	California In-State Generation (GWh)	California In-State Generation (%)	Northwest Imports (GWh)	Southwest Imports (GWh)	California Power Mix[a] (GWh)	California Power Mix (%)
2009 Total System Power						
Coal	3,735	1.8	810	19,502	24,046	8.1
Large Hydro[b]	25,147	12.1	-	2,099	27,246	9.1
Natural Gas	116,726	56.3	1,884	6,753	125,362	42.0
Nuclear	31,509	15.2	-	7,570	39,080	13.1
Oil	67	0.0	-	-	67	0.0
Other[c]	7	0.0	-	-	7	0.0
Renewables[d]	29,989	14.5	5,059	743	35,791	12.0
Biomass	5,940	2.9	885	-	6,825	2.3
Geothermal	12,907	6.2	-	738	13,645	4.6
Small Hydro[e]	4,044	2.0	1,052	-	5,096	1.7
Solar	850	0.4	-	-	850	0.3
Wind	6,249	3.0	3,122	5	9,375	3.1
Unspecified Sources of Power[f]	0	0.0	12,177	34,535	46,712	15.7
Total	**207,180**	**100.0**	**19,929**	**71,201**	**298,310**	**100.0**
2010 Total System Power						
Coal	3,406	1.7	783	18,236	22,424	7.7
Large Hydro	29,861	14.6	-	1,333	31,194	10.8
Natural Gas	109,481	53.4	1,330	10,625	121,436	41.9
Nuclear	32,214	15.7	-	8,211	40,426	13.9
Oil	52	0.0	-	-	52	0.0

Table 31-1
2009 and 2010 Total System Power for California

Fuel Type	California In-State Generation (GWh)	California In-State Generation (%)	Northwest Imports (GWh)	Southwest Imports (GWh)	California Power Mix[a] (GWh)	California Power Mix (%)
Other	0	0.0	-	-	0	0.0
Renewables	30,005	14.6	7,586	2,205	39,796	13.7
Biomass	5,745	2.8	1,149	-	6,894	2.4
Geothermal	12,740	6.2	-	673	13,413	4.6
Small Hydro	4,441	2.2	554	-	4,995	1.7
Solar	908	0.4	-	51	959	0.3
Wind	6,172	3.0	5,883	1,481	13,536	4.7
Unspecified Sources of Power[f]	0	0.0	14,978	19,881	34,859	12.0
Total	**205,018**	**100.0**	**24,677**	**60,492**	**290,187**	**100.0**

[a]Total of in-state and imported generation by fuel type.
[b]Defined as equal to or greater than 30 MW generating capacity.
[c]Includes other non-renewable fuels, such as petroleum coke.
[d]Includes wind and solar generation.
[e]Defined as less than 30 MW in generating capacity.
[f]The California Air Resources Board as of December 2011 was assessing the fuel sources of all imported power. Fuel source for imported power was not previously reported, and therefore is categorized as “Unspecified.”
Note:
GWh = gigawatt-hours
Source: CEC, 2011b.

Since 1983, 90 percent of all new generation in California was natural gas-fired, consisting primarily of either simple-cycle gas turbine peaker plants generally used for meeting peak power demands or to compensate for sudden changes in demand, and combined-cycle power plants used as intermediate or “load-following” power plants that can ramp power production up or down to meet demand through the day (CEC, 2003; CEC, 2012a). Gas-fired power plants are more efficient than other fossil-fueled plants; easier to site, operate, and permit than other options; and are cleaner than other combustion sources. In the mid-1980s, approximately 25 percent of the power plants were gas-fired. By 2009, approximately 42 percent of the energy used in California came from gas-fired plants. California’s fleet of gas-fired power plants is aging. As shown in Table 31-2, almost 60 percent of the gas-fired generation was built before 1980, and almost 50 percent was built before 1970. The older gas-fired power plants are being modernized and some older generation plants are being retired. As shown in Table 31-3, new generation has also come on line in recent years.

Table 31-2
Age of Gas-fired Electricity Generating Capacity in California

On-line Date	Capacity: MW	Capacity: % of Total Electricity Generating Capacity	Capacity: Cumulative % of Total Gas-Fired Electricity Generating Capacity
1940s	285	0.72	0.72
1950s	3,568	9.04	9.76
1960s	9,607	24.33	34.09
1970s	5,511	13.96	48.05
1980s	3,965	10.04	58.09
1990s	2,742	6.94	65.04
2000-2009	13,805	34.96	100.00
Total gas-fired capacity	**30,888**		

Note:
MW = megawatt
Sources: CEC, 2012a; CEC, 2012b

Table 31-3
WECC Transmission Plans by Circuit Mile Additions > 100 kV

Region	2008 Existing	2009 Existing	Under Construction	2010-2014 Planned Additions	2010-2014 Conceptual Additions	2015-2019 Planned Additions	2015-2019 Conceptual Additions	Total by 2019
Basin	N/A	12,763	189	1,508	280	2,291	1,503	18,534
Northern California	N/A	15,531	196	373	350	-	2,788	19,238
Southern California	N/A	12,057	224	410	492	-	415	13,598
Desert Southwest	15,562	15,049	26	1,129	807	127	253	17,391
Northwest Power Pool	43,255	30,431	220	194	20	810	10	31,685
Rocky Mountain Power Area	12,209	12,408	238	769	-	208	45	13,668
Canada	21,189	21,122	162	658	-	323	-	22,265
Mexico	1,313	1,402	-	129	-	102	-	1,633
Total WECC	120,532	120,763	1,255	5,170	1,949	3,861	5,014	138,012

Notes:
kV = kilovolt
WECC = Western Electricity Coordinating Council
Source: WECC, 2011.

During all but the most adverse water conditions, 10,928 MW of dependable generating capacity from hydroelectric resources are available to meet peak electricity demand in California during peak use times in July and August (CEC, 2012c). However, its hydroelectric output is highly variable year to year. In Dry years (e.g., 2001), hydroelectricity contributed only 13 percent of the state's total power (when combining both in-state and out-of-state generation). In wet years (e.g., 1983), hydroelectricity contributed 45 percent of the state's power. This variability must be accounted for in long-term planning.

The seasonal nature of its generation, such as the increased levels of generation that occur during spring runoff, can create difficulties in moving the excess power to markets that can use it, but also can greatly affect the electric power marketplace by reducing the price for off-peak power, potentially to negative values, during high runoff periods when hydroelectric projects would otherwise spill water rather than send it through the powerhouse. Hydroelectricity generation can be highly useful as a resource that can quickly ramp power operations up or down to compensate for sudden changes in demand or in generation, such as that caused by the variable nature of solar and wind generation. Used as a “firming” resource, hydroelectricity (with the proper configuration) can augment other renewable power production to provide a more reliable resource for planning purposes.

In November 2008, California’s former Governor Arnold Schwarzenegger signed Executive Order S-14-08 to raise the State’s renewable portfolio standard (RPS) to 33 percent by 2020 by requiring electricity retail sellers to serve 33 percent of their load with renewable energy by 2020. In the ongoing effort to codify the 33 percent by the 2020 goal, California’s Governor Jerry Brown and Legislature passed Senate Bill X1-2 in April 2011. The legislation requires all of California’s utilities to obtain 33 percent of their overall electricity generation from renewable resources, like solar and wind, by 2020. Federal policy is also supportive of electricity generation from renewable resources. Department of Interior Secretarial Order 3285, issued on March 11, 2009, “establishes the development of renewable energy as a priority for the Department of the Interior.”

The 33 percent renewables target by 2020 triggered the need to plan and build energy storage technologies to sustain grid-reliability and mitigate the inherent fluctuations in solar and wind energy production. Electric transmission grid operators have a limited set of technologies that can be deployed to quickly respond to the uncertainty as net demand changes on the grid, most of them are with limited capacity and/or energy. Hydropower pumped-storage is the leading alternative for grid scale energy storage. An important distinction has to be made between “standalone” pumped-storage assets and those assets capable of pumpback that are an integral component of a conventional hydropower setup. The difference between the two is the limited dispatchability of the latter because of the need to sustain the water delivery objective that a specific project was built to serve in the first place.

Renewable integration is the concept of making available, deploying, and operating generation and/or load resources that are flexible and controllable to ensure the reliability of the electric grid, in response to the inherent variability and uncertainty of renewable generation resources (wind and solar). Nationally, there are ongoing efforts to assess the needs and costs of integrating renewable energy resources as they get developed, deployed, and penetrate different electricity grids. In California, electricity market participants, regulatory agencies, and grid operators are collaborating on developing methodologies and models to identify the State’s resources need for renewable integration. Options, such as adding gas turbines to compensate for the variability of renewable energy, are being considered, but these are the least favorite solutions, as they diminish the benefits and purpose of deploying renewable energy resources. Other options, such as energy storage, curtailments, and smart grids are also being considered.

One of the most viable options for renewable integration would be an advanced energy storage installation. Pumped-storage, batteries, compressed air, and flywheels are among the different energy storage technologies available, being developed, and deployed today. Some storage technologies are better suited for short-term and fast response “capacity” applications (batteries, flywheels) that could be used to manage grid imbalances and volatility through regulation services. Others, such as pumped-storage and compressed air are better suited for long-term and intermediate response “energy” applications needed to firm up highly variable wind and solar generation.

Pumped-storage projects can quickly ramp up power operation by releasing water from the upper reservoir (forebay) to the lower reservoir (afterbay) during high-demand periods. Water is then pumped back up from the lower reservoir to the upper reservoir during off-peak hours, often taking advantage of very low wholesale power prices for power available during off-peak periods. Major pumped-storage facilities in California include:

- Pacific Gas & Electric’s 1,212-MW Helms Pumped Storage Project in Fresno County (standalone)
- DWR’s 644-MW Edward C. Hyatt (Butte County), 126-MW Thermalito (Butte County), and 424-MW San Luis/W.R. Gianelli (Merced County) Pumped-Storage Projects (integral to DWR’s Lake Oroville)
- Los Angeles Department of Water and Power’s (LADWP) 1,331-MW Castaic Pumped Storage Project in Los Angeles County, which takes advantage of SWP deliveries into Castaic Lake (integral to LADWP’s water system)
- Southern California Edison’s (SCE) 200-MW Eastwood project in Fresno County (standalone)

31.2.2.2 Electric Transmission System

California’s high-voltage electric transmission system connects the different regions of the State to each other, to varying degrees, as well as to the transmission systems of the surrounding western states, Canada, and Mexico. The degree to which areas are interconnected depends upon the availability of transmission capacity between the areas. These interconnected electric transmission systems allow power purchases and sales to extend beyond State and national borders. More than 300,000 miles of electrical transmission or distribution lines currently cross California, including more than 32,000 miles of high-voltage electric transmission lines (CEC, 2011a).

Originally, California’s electric transmission system was built by the utility companies to connect their major load centers to the generation sources. Some generation sources were built close to the load centers, requiring relatively short transmission lines; others, such as hydroelectric plants, were located far from the metropolitan areas they serve. The investor-owned utilities (IOUs) – primarily PG&E, San Diego Gas & Electric (SDG&E), and SCE – built much of the electric transmission lines throughout the state to serve their customers. The federal government, through WAPA, also built major electric transmission systems to deliver power from federally owned hydroelectric dams to load centers throughout the west. These public and private electric transmission systems were operated independently of each other, with some ties to the consumer-owned utilities. An example is LADWP, which developed its own transmission system to connect generation in California, Nevada, Arizona, and New Mexico to load centers in the City of Los Angeles. Over time, as development of new power generation close to the load centers became more difficult, the IOUs and the federal government built high-voltage electric transmission systems connecting California to neighboring states – primarily to import less expensive hydroelectricity from the northwest and thermal power from the southwest.

This network of conductors, switchgear, and transformers allows long-distance sales and purchases of power, with deliveries across the grid paid for through tariffs charged by the electric transmission system owners. When a new load or generator comes on line, power flows over the grid must be reconfigured to accommodate the increase in demand or generation. The physical process of inserting or withdrawing additional power from the grid can reduce reliability and may warrant construction of additional infrastructure, such as upgrading an existing electric transmission line to handle more power, or constructing a new power plant in areas where transmission upgrades are not feasible.

The California electric transmission grid is shown in Figure 31-2. The areas that are highlighted are those that are most heavily used. As shown, both the northern and southern regions of the state have an extensively developed grid system. These two areas are connected primarily through one high-voltage line known as “Path 15.” Path 15 is often congested, hampering the ability to transfer power between northern and southern California. The electric transmission system in northern California is owned largely by the federal government (through WAPA) and PG&E. Transmission system planning is driven by Federal Energy Regulatory Commission (FERC) orders 890 and 1000, WECC economic transmission planning through the Transmission Expansion Planning Policy Committee (TEPPC) and California Transmission Planning Group (CTPG) that was formed in 2009 to jointly plan and coordinate transmission planning activities. The CAISO planning process includes both a grid reliability planning process and a more long-term transmission system planning process for all transmission facilities within its control area, which consists of the service territories of the State’s three largest investor-owned utilities. The reliability planning process compares projected load growth against projected generation reserve margins in all areas within the CAISO control area, identifies potential local reliability problems where available generation may not be able to meet maximum local loads, and identifies where the electric transmission system may be too congested to compensate for a system disturbance, such as an unexpected loss of a major generator or transmission line. The short-term solution to any one reliability problem may be to contract for additional generation capacity within the local area, or to construct additional transmission facilities that would allow more remote generation to serve the local load (CAISO, 2011).

The longer term electric transmission planning identifies transmission upgrades needed to serve future loads, as well as to compensate for changes in generation patterns, such as the renewable power generation being introduced into the grid to meet Renewable Portfolio Standards (RPS), which pursuant to State law require that 20 percent of retails sales of all utilities in the state come from renewable resources by the end of 2013, to 25 percent by the end of 2016, and to 33 percent by the end of 2020. Identified reliability-related transmission projects from the reliability planning process are also considered during the transmission system planning process. When needed, transmission system projects are identified during the California Public Utilities Commission (CPUC) transmission planning process which includes CAISO transmission planning process. The transmission system owner then seeks approval for the project through the appropriate regulatory authority, which for PG&E is the CPUC. As one of four power marketing agencies under the Department of Energy, WAPA has its own approval process for upgrading its transmission facilities, although the rates it charges to recover the cost of improvements are approved by FERC.

Reliability planning is also conducted on a wider scale by WECC (Figure 31-3). As designated by the North American Electric Reliability Council (NERC), WECC is the regional entity that was delegated responsibility to implement NERC’s mandatory reliability standards in the Western Interconnection, and provides an environment for coordinating the operating and planning activities of its members. WECC works closely with PG&E and other California utilities to gather data regarding projected future generation reserve margins and planned transmission upgrades to ensure that reliability standards are met throughout the region.

WECC data show that, of the 120,763 circuit-miles[3] of high-voltage transmission lines in use throughout the WECC region in 2009, 15,531 miles are north of the Path 15 transmission line in northern California, and 12,057 miles are south of Path 15 in southern California. WECC projected in its 2011 Long-Term Reliability Assessment that the total circuit-miles would rise to 138,012 miles WECC-wide, with 19,238 miles located in northern California and 13,598 miles located in southern California in 2019 (NERC, 2010 and WECC, 2011).

31.2.2.3 Demand Forecast

Over the 10-year period from 2000 to 2010, census data show that California's population increased from 33.9 million to 37.2 million, representing an average annual compounded growth rate of 0.95 percent. Using an estimate made in 2007, prior to the downturn in the economy, California's Department of Finance projected that over the next decade (2010 to 2020) the state population would increase by 5 million people, for an average compounded growth rate of 1.2 percent (DOF, 2009; DOF, 2007).

The increasing demand for electrical energy is based on growth in both population (i.e., households) and commerce (commercial and industrial businesses). Weather can also significantly influence electricity demand. California's peak load was approximately 54,000 megawatts (MW) of electric power in 2009. For that year, the commercial sector accounted for approximately 37 percent of the state's electricity demand, followed by the residential sector, which accounted for approximately 33 percent, and the industrial sector, at approximately 28 percent. The remaining two percent came from government buildings and lighting, such as streetlights and airport lights. Residential demand is projected to grow by 18 percent over the period 2009 to 2035, spurred by population growth, rising disposable income, and continued population shifts to warmer regions with greater cooling requirements. Commercial sector electricity demand is projected to increase by 43 percent over that same period, led by the service industries. Industrial electricity demand is projected to grow by nine percent, slowed by increased competition from overseas manufacturers and a shift of U.S. manufacturing toward consumer goods that require less energy to produce. Increased use in the residential sector will come both from an increased average use per household (i.e., larger homes, more homes with air conditioning, and increased home electronics) and a population increase. Historically, the amount of electricity used per household increased by approximately 0.7 percent per year. This trend is expected to continue, with the decrease in electricity use for home lighting, refrigeration, air conditioning, and heating use as the efficiency of these products improve, balanced against the increase in popularity of consumer electronics (DOE, 2011).

In a 10-year forecast released in November 2007, the California Energy Commission projected that electricity demand in the State would increase at a rate of 1.3 percent per year from 2010 to 2018, with peak demand increasing at an annual average rate of 1.4 percent, and the maximum peak load increasing at an annual rate of 1.35 percent (CEC, 2007a). However, the downturn in the economy in 2009 to 2010 had a significant effect on electricity use in the State, such that the projected maximum demand for the summer of 2011 was actually two percent lower than the projected maximum demand for the summer of 2010 (CEC, 2011a). Across the WECC region, the 2010 total region-wide demand of 148,365 MW is projected to increase by 1.4 percent per year to 168,237 MW in 2019, while California summer and winter total internal demands are projected to increase at annual compound rates of 0.8 percent and 1.2 percent, respectively. California annual energy use is projected to grow at an annual compound rate of 1.2 percent (NERC, 2010). However, these projections are between 2.0 and 6.2 percent lower than the

[3] A circuit-mile is one mile of a single circuit, which for alternating current (AC) circuits are generally three-phase, and therefore, have three separate conductors making up a single circuit. Direct current (DC) circuits consist of two phases, and therefore, have two conductors needed per single circuit.

2009 projections, showing the effect of the downturn in the economy, and the difficulty of accurately predicting future demand.

Electricity use is expected to increase over the long-term, but will be balanced in California by the continued application of cost-effective energy efficiency programs, and replacement of appliances and other devices with more efficient technology. California has led the nation in efficiency gains for decades, with the result that it uses less energy per capita than any other state. California's 6,721 kWh per capita energy use is approximately half the national average of 12,167 kWh per capita (CEC, 2010).

Demand for electricity in northern California can ebb and flow dramatically, both within each year and from year to year, as can available generation. Demand is highest during heat waves[4] and is generally lowest at night during spring and fall, when heating and cooling demand is low. Competition for off-peak power purchases is much more robust during summer months, as is reflected in the considerably higher market prices. Northern California's summer peak demand is projected to grow from 25,310 MW in 2010 to 27,502 MW in 2019, for an annual compound growth rate of 0.9 percent. Winter peak demand is expected to grow from 18,155 MW in 2010 to 20,177 MW in 2019, an annual compound growth rate of 1.2 percent. Annual energy use in northern California is expected to grow from 128,119 GWh in 2010 to 140,378 GWh in 2019, for an annual compound growth rate of 1.1 percent (NERC, 2010).

31.2.3 Primary Study Area

The Primary Study Area is limited to those areas that would be most directly affected by Project power operations, including the specific transmission lines that the Project would connect to, and other CVP and SWP projects that would be re-operated by the alternatives. The Primary Study Area includes the service territories of entities that currently purchase power from the SWP and CVP.

31.2.3.1 Central Valley Project

The Central Valley Project, one of the Nation`s major water conservation developments, extends from the Cascade Range in the north to the plains along the Kern River in the south. The CVP is managed by the U.S. Bureau of Reclamation (Reclamation). Initial features of the project were built primarily to protect the Central Valley from water shortages and floods, but the CVP also improves Sacramento River navigation, supplies domestic and industrial water, generates electric power, conserves fish and wildlife, creates opportunities for recreation, and enhances water quality. The CVP is comprised of 20 dams and reservoirs, 39 pumping plants, 11 power plants, and 500 miles of major canals manage nearly nine million acre-feet of water annually, delivering water to customers from Redding to Bakersfield. The CVP includes four major canals: the Tehama-Colusa, the Contra Costa, the Delta-Mendota, and the Friant-Kern. CVP also includes storage reservoirs on the Trinity, Sacramento, American, Stanislaus, and San Joaquin rivers, and offstream storage at San Luis Reservoir.

San Luis Reservoir is part of both the CVP and SWP; it is a pumped-storage operation that takes water from, and makes deliveries to, both the California Aqueduct and the Delta-Mendota Canal, provides storage for later use, and generates up to 424 MW of power. The federal-only portion of the San Luis Unit includes the O'Neill Pumping-Generating Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and San Luis Drain. The C.W. "Bill" Jones Pumping Plant (formerly the Tracy Pumping Plant) lifts Delta water 197 feet up and into the Delta-Mendota Canal, and moves water through the canal to San Luis Reservoir. Each of the six pumps at the plant is capable of pumping 767 cfs. Farther south,

[4] Heat waves are defined as three or more days of greater than 100-degree temperatures.

Dos Amigo Pumping Plant, a joint CVP and SWP facility located 17 miles south of O'Neill Forebay, lifts water 113 feet to permit gravity flow to the end of San Luis Canal at Kettleman City. The plant contains six pumping units, each capable of delivering 2,200 cfs at 125 feet of head (WAPA, 2004).

Of the water conveyed by the CVP, approximately five million acre-feet is delivered to farms in northern California, and approximately 600,000 acre-feet is delivered to municipal and industrial users. The CVP is a net energy producer. The CVP's hydroelectric facilities produce approximately 5,600 GWh of electricity annually; 1,300 to 1,400 GWh are used by its pumping facilities. Total maximum power production capacity is approximately 2,100 MW; total pumping demand is approximately 600 MW. The CVP facilities most affected by a new pumped-storage hydroelectric project in northern California would be Folsom (1.0 MAF, 221 MW), New Melones (2.4 MAF, 380 MW), San Luis (2.0 MAF, 227 MW), Shasta (4.5 MAF, 710 MW) and Trinity (2.4 MAF, 575 MW). Together, these facilities produced 2,113 MW and 4,557 MWh on average between 2004 and 2010 (Reclamation, 2011).

Production capacity and pumping power vary significantly from year to year and day to day, depending upon hydrological conditions, reservoir levels, and operational constraints such as fish protection measures. For example, for the one-year period beginning in July 2011, the projected effective generating capacity of the CVP was expected to vary between a low of 715 MW (October 2011) and a high of 1,575 MW (July 2011) (Reclamation, 2011).

CVP power is marketed by WAPA, which sells CVP power to preference power customers, primarily to consumer-owned or government entities, including municipal utilities, irrigation districts, public utility districts, Native American tribes, and large government facilities, such as Department of Energy laboratories. As with all power produced by federally owned hydropower facilities, consumer-owned and government entities are given preference to CVP power sales. Approximately 85 preference power customers purchased CVP power in fiscal year 2005, although 71 percent was allocated to just six customers: Sacramento Municipal Utility District, the City of Redding, Silicon Valley Power (City of Santa Clara), the City of Roseville, the City of Palo Alto and the U.S. governmental facilities in the San Francisco Bay Area (TCCA and Reclamation, 2006).

CVP power and energy allocations are based on predicted hydrological conditions, using a long-term generation model that determines available capacity and energy, and the needed reserve margin. Energy available after serving CVP loads plus a reserve margin is called the Base Resource, which is allocated pursuant to long-term contracts for each year based on this formula:

> Base Resource = Gross Generation - Transmission Losses + Project Use Purchase - CVP Use Load - First Preference Customer Load[5]

Energy generation beyond the allocated amounts is marketed by WAPA to preference customers pursuant to long-term contracts, with any surplus sold on a short-term basis to others when available. Customers are generally divided into three groups for the marketing plan: base resource, variable resource, and full load service customers. Base resource customers are those customers that will only receive base resource energy from WAPA. Variable resource customers are customers that opt for base resource firming service and/or supplemental energy from WAPA in addition to their base resource. These first two categories of customers receive approximately 85 percent of the base resource. Full load service customers are

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[5]Pursuant to the Trinity River Act of 1955, 25 percent of the power delivered from the CVP's Trinity River Division must be reserved for customers within Trinity County. Similarly, the Rivers and Harbor Act of 1962 authorizing the New Melones Project specified that up to 25 percent of the energy resulting from that project is reserved for customers in Calaveras and Tuolumne counties. Customers receiving energy pursuant to these authorizations are referred to as "First Preference" customers.

customers that will have their total load met by WAPA through a combination of their base resource and additional purchases by WAPA on their behalf. This category of customers receives approximately 15 percent of the base resource.

31.2.3.2 State Water Project

The SWP is a complex network of 34 storage facilities, reservoirs, and lakes; 20 pumping plants; four pumping-generating plants; five hydroelectric power plants; and approximately 701 miles of open canals and pipelines designed to move water from the Feather River basin and Lake Oroville in northern California to users in the Central Valley and southern California. It is the nation's largest state-built water and power development and conveyance system, and the largest electricity user in the state. DWR manages the SWP to deliver water to its 29 long-term water contractors and their member water agencies. The service areas of these contracting agencies extend from Plumas County in the north to San Diego County adjacent to the Mexican border. These contractors' service areas comprise almost one quarter of California's land area and more than two-thirds of its population. SWP facilities also provide flood control, recreation, and fish and wildlife enhancement. The SWP contractors repay all costs related to project construction and operation, with annual repayments of approximately $1 billion per year (based on 2007 data). Of that amount, operation and maintenance costs account for 30 percent; power purchases, less generation and sales, amount to 20 percent; and bond service payments of principal and interest and repayments for other capital financing account for 50 percent (DWR, 2012).

The SWP has a net energy use of approximately 4,600 GWh, making it the largest single consumer of electric power in California, consuming approximately 2.5 percent of the State's total electric energy production. In 2007, energy used at the SWP pumping and generating plants totaled 9.77 GWh, and 2.26 GWh was sold to 20 utilities and 22 power marketers (DWR, 2012). SWP energy use and production is highly variable, depending on hydrologic and storage conditions. For example, over the period 1990 to 2001, net energy use varied from a low of 3,421 GWh in 1998 (a very wet year with high hydroelectric production) to a high of 8,171 GWh in 1990 (in the middle of the 1987 to 1992 drought).

The SWP's hydroelectric plants (Hyatt, Thermalito, Gianelli, Warne, Alamo, Thermalito Diversion, Mojave, and Devil Canyon) have a total generating capacity of approximately 1,475 MW. In northern California, the Hyatt Pumping/Generating Plant pumps water from the Thermalito Afterbay to Lake Oroville, in pumping mode, and also produces power when water is released from the lake to the afterbay. Hyatt has three pumping/generating units, each producing 173,000 horsepower and up to 1,870 cfs of flow in pumping mode, and 113 MW (at 615 feet of static head and 2,850 cfs flow) in generating mode; and three generating units, each capable of producing 106 MW (at 615 feet of static head and 2,800 cfs flow). In total the Hyatt plant has a generating and pumping flow capacity of 16,950 cfs and 5,610 cfs, respectively, and can generate up to 645 MW of power. Just downstream, the 114-MW Thermalito Pumping-Generating Plant is designed to operate in tandem with the Hyatt Pumping-Generating Plant and has generating and pumpback flow capacities of 17,400 cfs and 9,120 cfs, respectively. Thermalito Diversion Dam, four miles downstream of Oroville Dam, creates a tailwater pool for the Hyatt Pumping-Generating Plant and is used to divert water to the 10,000-foot-long Thermalito Power Canal designed to convey generating flows up to 16,900 cfs to Thermalito Forebay and pumpback flows to the Hyatt Pumping-Generating Plant. Storage in Thermalito Forebay and Thermalito Afterbay is used to generate power and maintain uniform flows in the Feather River downstream of the Oroville Facilities. Thermalito Afterbay storage also can be used for pumpback operations, which in total may consume about 390,000 MWh of energy annually. Generation provided by pumpback activity has the potential to contribute approximately six or seven percent to the total annual Oroville Facilities generation of approximately 2.08 GWh per year[6] (DWR, 2012).

Further south (as described above) is the San Luis Unit, part of both the CVP and SWP, consisting of the O’Neill Dam and Forebay, B.F. Sisk San Luis Dam, San Luis Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and San Luis Canal from O’Neill Forebay to Kettleman City. O’Neill Pumping-Generating Plant takes water from the Delta-Mendota Canal and discharges it into the O’Neill Forebay, where the California Aqueduct (a SWP feature) flows directly. The William R. Gianelli Pumping-Generating Plant lifts water from O’Neill Forebay using eight 63,000 horsepower pumps and discharges it into San Luis Reservoir. During releases from the reservoir, these plants can generate up to 424 MW of electric power by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant, where the water is lifted more than 100 feet to permit gravity flow to the end of San Luis Canal at Kettleman City.

Moving water through the California Aqueduct is a series of large pumping plants, starting with the Harvey O. Banks Pumping Plant, located 2.5 miles southwest of the Clifton Court Forebay on the California Aqueduct. Farther south along the California Aqueduct, the Chrisman, Edmonston, and Pearblossom pumping plants historically consumed the highest amount of energy. The Chrisman and Edmonston pumping plants provide 524 and 1,970 feet of lift, respectively, to convey California Aqueduct water across the Tehachapi Mountains. The Pearblossom Pumping Plant lifts water approximately 540 feet and discharges the water 3,479 feet above mean sea level, the highest point along the California Aqueduct.

Using gravity on the downhill side of the Tehachapis, flows through the Alamo Power Plant, Mojave Siphon Power Plant, Devil Canyon Power Plant, and Warne Power Plant, together with generation from the William R. Gianelli Plant (located north of the Tehachapis), generated 1.99 GWh of electric energy in 2007, approximately one-fifth of the total energy used by the SWP. The Alamo Power Plant uses the 133-foot head between Tehachapi Afterbay and Pool 43 of the California Aqueduct to generate electricity. The Mojave Siphon Power Plant generates electricity from water flowing downhill after its 540-foot lift by the Pearblossom Pumping Plant. The Devil Canyon Power Plant generates electricity with water from Silverwood Lake with more than 1,300 feet of head, the highest water head in a power plant in the SWP system. The Warne Power Plant uses the 725-foot drop from the Peace Valley Pipeline to generate electricity (DWR, 2012).

SWP manages its loads and generation resources to maximize off-peak pumping load and peak generation to minimize water delivery costs. The SWP’s power resources portfolio also includes contracts for power purchases, sales, and exchanges. The SWP is operated as an independent bulk power entity and is interconnected with the PG&E, Southern California Edison (SCE), and WAPA transmission systems. DWR dispatches the SWP’s own loads and resources and coordinates its power operations through CAISO. The SWP makes yearly projections for energy needs to ensure it has enough power to make scheduled deliveries. SWP-related pump load is met through SWP generation, long-term, mid-term, and short-term contracts and purchases.

[6] This value is the average generation from 1982 to 2001.

31.2.3.3 Northern California Transmission System

The transmission system in northern California consists of dozens of high-voltage (230-kV to 500-kV) transmission circuits, most aligned north and south, which connect the region's diverse network of power plants to load centers throughout the State. PG&E, WAPA, and the Transmission Agency of Northern California (TANC)[7] each own major transmission lines in the region, including in the immediate vicinity of the Project. PG&E has more than 18,600 circuit-miles of transmission lines and 141,000 miles of distribution lines connecting its customers from Eureka to Bakersfield. WAPA's 856 circuit-miles of high-voltage transmission lines can deliver power from the Oregon border as far south as the San Luis Reservoir.

As shown in Figure 31-4, four high-voltage transmission lines are located in western Colusa County in the vicinity of Project facility locations, and the Project could interconnect with any or all of these lines. These are:

- A 230-kV WAPA line extending from the Olinda (Vic Fazio) Substation in Shasta County, south through Tehama, Glenn, Colusa, Yolo, Solano, Contra Costa, and Alameda counties to connect to the Jones Pumping Station at the Tracy Substation, and farther south to other pumping plants along the Delta-Mendota Canal. This line distributes power from CVP facilities to federally owned pumping stations.
- Two 230-kV lines owned by PG&E, which roughly parallel the WAPA-owned line along most of its northern California route, including in Glenn, Colusa, Yolo, Solano, Contra Costa, and Alameda counties. These lines are part of PG&E's 230-kV network, which interconnects PG&E's hydroelectric facilities and various other power plants to load centers throughout northern California.
- The COTP, a 500-kV line owned by a consortium of public and private utilities, including TANC, which is comprised of the COTP manager, PG&E, WAPA, the City of Redding, and the Carmichael and San Juan water districts. The COTP extends from the Bonneville Power Administration's Captain Jack Substation in Southern Oregon south to WAPA's Tracy Substation near the CVP's and SWP's delta pumping plants, and on to PG&E's Tesla Substation. It is interconnected with and parallel to the Pacific Intertie, and consists of three segments: a 148.5-mile-long Northern Segment between the Captain Jack Substation and the Olinda (Vic Fazio) Substation in Tehama County; the 190-mile-long CVP Upgrade Segment between the Olinda Substation and the Tracy Substation in San Joaquin County, near the Tracy Pumping Station; and the Tesla Bypass Segment, a seven-mile-long double circuit from the Tracy Substation to an interconnection with the Pacific AC Intertie on PG&E's 500-kV transmission line between the Tesla and Los Banos substations. The COTP also includes the Maxwell Compensation Station, located approximately six miles south of the Funks Reservoir, which helps condition the power on the 500-kV line.

In addition to the large hydroelectric projects of the CVP and SWP, more than 200 power plants are located in the Primary Study Area; most are smaller than 50 MW. Most of the larger power plants in northern California are located near Sacramento or the San Francisco Bay areas. Only a few power plants of any size are located in the five counties surrounding the Project (Tehama, Glenn, Colusa, Lake, and Mendocino counties), the largest of which is PG&E's 660-MW Colusa Generating Station, located approximately three miles north of the proposed Sites Reservoir site (CEC, 2012a). The Colusa

[7] TANC is a joint powers agency created in 1984 by a group of publicly-owned utilities to plan and construct the California-Oregon Transmission Project (COTP).

Generating Station, which began commercial operations in December 2010, interconnects to the two 230-kV PG&E lines described above, and takes water from the Tehama-Colusa Canal for plant use (CEC, 2007b).

31.3 Environmental Impacts/Environmental Consequences

31.3.1 Regulatory Setting

The California electrical utility sector is regulated at the federal, State, and local levels. Below is a list of federal and State legislation, regulation and policy affecting California's electric utility industry. These regulations are discussed in detail in Chapter 4 Environmental Compliance and Permit Summary of this EIR/EIS.

31.3.1.1 Federal Plans, Policies, and Regulations

- Federal Clean Air Act of 1970 and 1990
- Federal Power Act of 1920, and its various updates, including:
  - Public Utility Regulatory Policies Act (PURPA) of 1978
  - Electric Consumers Protection Act (ECPA) of 1986
  - Energy Policy Acts of 1992 and 2005

31.3.1.2 State Plans, Policies, and Regulations

- California Global Warming Solutions Act of 2006 (AB-32)
- California Clean Air Act of 1988
- The Warren-Alquist Act
- The Electric Utility Industry Restructuring Act of 1996 (AB 1890)
- Diesel Risk Reduction Plan/Diesel Fuel Regulations of 2000
- California Renewables Portfolio Standard Program of 2002 (SB1078)

31.3.1.3 Regional and Local Plans, Policies, and Regulations

- Regional Clean Air Incentives Market (RECLAIM) program for NO_x and SO_x of 1993
- Glenn County General Plan
- Colusa County General Plan

The Glenn County General Plan does not currently address electric power transmission or generating projects. GCID does not own or operate any power facilities, but instead purchases all of its power from WAPA and PG&E.

The Colusa County General Plan, approved in July 2012, endorses renewable energy project development, renewable energy use, and energy conservation; and commercial alternative energy facilities, including solar, wind, and biomass are allowed in the Agriculture General, Agriculture Upland, Industrial, Forest, and Resource Conservation land use designations with a Conditional Use Permit. It also states that any proposed pipeline or transmission line within the county shall be aligned to minimize interference with agriculture and "should be undergrounded to the greatest extent feasible;" and it allows for the development of sustainable energy production facilities within the county on non-prime agricultural lands (Colusa County, 2012).

31.3.2 Project Operational Scenario

31.3.2.1 NODOS as an Energy Storage Asset

Energy storage is the concept of storing excess (and/or low cost) energy during low demand periods for later use during high energy demand (and/or high cost) periods. Energy storage technologies, their capital installation costs, and their electricity grid applications vary significantly from one technology to another and from one market to another. Today, pumped-storage is considered to be one of the most viable forms of energy storage, due its high potential capacity and energy (100s MW and 1,000s MWh), and long discharge time (minutes to hours). Other available energy storage technologies include, but are not limited to, batteries, compressed air, capacitors, and flywheels. Most of these technologies are limited by capacity and/or discharge (time of sustained generation).

Typically, pumped-storage setup includes lower and upper reservoirs, interconnected through hydraulic conveyance/conduit, and a pumping-generating plant. The pumping-generating plant would be interconnected to the electrical grid via a switchyard and transmission lines. Sizing the different components of a pumped-storage setup is a complex multidisciplinary exercise (e.g., engineering, economics, and environmental) that is beyond the scope of this chapter. Operating a pumped-storage facility entails pumping the water from the lower reservoir into the upper reservoir when excess and/or low cost energy is available. The consumed energy (minus losses) would be transformed to potential energy through the hydrostatic head of the water stored in the upper reservoir. When there is a need for energy, capacity, and/or ancillary services (including renewable integration services), water would be released from the upper reservoir into the lower reservoir through the hydraulic turbines to generate electricity. The energy (in MWh) generated from releasing a unit volume of water relative to the energy consumed to pump that unit volume of water into the upper reservoir would be the cycle efficiency (or recovery rate) of that specific pumped-storage plant. Cycle efficiency varies with the net head across the pumping-generating units and the discharge of the water at the time of pumping and generation (subject to water surface elevation in the upper and lower reservoirs, and plant efficiencies). Average cycle efficiency of a pumped-storage setup (which would be site- and technology-specific) may range between 70 percent and 80 percent (with new pumping-generating technology units cycle efficiencies are approaching 85 percent).

The Project is being planned as a multi-objective project, and one of these objectives would be pump-back operations. Another objective for the Project would be potential participation in providing renewable integration services to the electrical grid. The Project would perform as an energy storage asset either through daily time-shifting (from off-peak to on-peak hours), or through seasonal-shifting (from low spring demand to high summer demand). The Project’s benefits in this context would be numerous, including economic incentives, GHG emissions reduction, renewable energy integration, system reliability, and transmission support. The Project, through its water diversion and release cycles from the Sacramento River (seasonal-shifting), and/or daily pump-back operations (time-shifting) would perform as an invaluable energy storage asset that could support the State’s electrical grid.

31.3.2.2 NODOS Project Operations

The Project is expected to operate in a similar manner to the San Luis Reservoir/O’Neil Forebay/Gianelli Powerhouse complex without the limitation of age and design of these facilities that do not allow them to operate in a daily pump-back manner. A detailed description of this daily pump-back operation and the associated benefits is provided in the following paragraphs. On a seasonal basis, water would be pumped from the Sacramento River through the existing Tehama-Colusa (T-C) and Glenn-Colusa Irrigation

District (GCID) canals and/or the proposed Delevan Pipeline into Holthouse Reservoir, where it would be lifted as much as 328 feet by the Sites Pumping/Generating Plant into Sites Reservoir throughout the winter and spring months for storage. The water would later be released for irrigation in the Central Valley, or for M&I use for any entity capable of receiving water deliveries from the Sacramento River or the Sacramento-San Joaquin Delta. Water releases from the Project would be coordinated with releases from Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and San Luis Reservoir to obtain the optimal benefits from both systems while still meeting ecosystem goals.

For Project operations, the base assumptions and scenarios used in developing the CALSIM II model were maintained for the different Project components. The CALSIM II model was used to simulate the operations of the Project, as a component of the integrated SWP and CVP operations. The CALSIM II model is a tool that was setup to emulate the operations strategy set forth for the Project, and to help determine many of the Project benefits and impacts. More details on the CALSIM II model formulation are available in Section 31.3.4.2.

For the purpose of modeling the power operations of the Project, three modes for Project operations were identified: Diversion mode (pumping from the Sacramento River to fill up Sites Reservoir); Release mode (generation) from Sites Reservoir to meet Project water release objectives; and a Pump-back mode to better use residual capacities of the different Project components. The Project Pump-back mode is meant to enhance the Project economics by capturing opportunities offered by the energy market (energy price differentials between on-peak and off-peak hours), and to provide the support/products needed to integrate renewable energy (e.g., wind, solar).

In modeling the power needs for the Diversion mode, an optimization strategy was developed to shift most of the pumping operations (i.e., pump load) to off-peak hours, when excess renewable and/or lower GHG emissions energy is available. Therefore, minimizing energy costs of pumping operations, reducing GHG emissions resulting from pumping operations, and potentially providing renewable integration services, yet, maintaining Project water operations objectives. Flat monthly pumping operations would be maintained (where/when applicable, 24 hours a day, seven days a week), for all three diversion points along the Sacramento River, so the Project would maintain its primary objective of capturing excess flood water in the Sacramento River. Once water is diverted from the Sacramento River into Holthouse Reservoir, the rest of the diversion operations (i.e., pumping into Sites Reservoir) could be optimized to better use Sites Pumping Plant capacity, and the available storage in Holthouse Reservoir. It would retain the on-peak diversions from the Sacramento River in Holthouse Reservoir (as scheduled) and to pump that water into Sites Reservoir in the off-peak hours (on a daily basis). The intent of reshaping the Diversion mode is to allow the Project to participate in providing renewables integration services, reduce its GHG emissions, and avoid on-peak high electricity costs. This shift in operations would allow generating facilities to operate during the on-peak hours (through a controlled water release from Sites Reservoir into Holthouse Reservoir), and provide an opportunity to superimpose the Pump-back mode on the Project Diversion mode. In an optimized mode and in the on-peak (or super-peak) hours, Sites Pumping/Generating Plant would be available for generation. In the off-peak hours, the residual pumping capacity would be available to pump the water back into Sites Reservoir.

For the water Release mode (i.e., generation) of the Project, an optimization strategy was developed to shift water releases and generation to the on-peak hours, to be able to displace high GHG generating plants, provide integration services to renewable generation, and to maximize generation revenues from the Project's generation facilities. For this strategy, and to the extent physically possible, all intended daily water releases from Sites Reservoir into Holthouse Reservoir would occur during the on-peak hours (or super peak hours). Incidental to the on-peak releases from Sites Reservoir into Holthouse Reservoir, water would be released into the Terminal Regulating Reservoir (TRR), T-C Canal, and the Sacramento River up to the capacities of these facilities (and within the planned limits for the water release). The residual water in Holthouse Reservoir (from the on-peak Sites Reservoir releases) would be released during the off-peak hours to satisfy water delivery obligations of the Project. A key requirement for this strategy to be effective is that Holthouse Reservoir's active storage would be made available before the beginning of the next on-peak cycle (i.e., next day's cycle). Optimizing the Release mode would better use Sites generation capacity (through shifting renewable generation from off-peak hours, provide renewable integration services, and maximize revenues), and provide an opportunity to superimpose a pump-back operation cycle on the Release mode.

The Project, through its water diversion and release cycles from the Sacramento River and/or daily pump-back operations, would perform as an invaluable renewable integration and an energy storage (resource-shifting) asset that could support the State's electrical grid. If the Project were to deploy variable speed pumping-generating units (a decision would be made during the design stage), then the Project would be able to provide integration services needed to firm up highly variable wind and solar generation. In the pumping mode, some of the Project's pumping load (subject to physical and operational constraints) would follow the variable wind generation (mostly in off-peak hours). In the generation mode, some of the generation capacity would be offered to provide regulation services needed to firm up wind and solar generation (mostly in on-peak hours).

The net result from the Project's operations is that the Project would be able to help the grid by shifting cleaner (renewable energy, including hydropower, or at least energy with lower GHG emissions) resources from the off-peak hours to the on-peak hours. In addition, and if properly equipped with variable speed units, it could provide renewable integration services, thereby displacing single cycle combustion turbines and combined cycle gas turbines, otherwise, it would be needed to firm up renewable energy resources. Although the Project is a net energy consumer, when Project's operations get optimized, the Project would have a positive impact through its ability to perform resource shifting, renewable integration, and lower overall energy market's GHG emissions.

A third component of the Project power operations is a daily pump-back operation. For periods when the Project is in neither Diversion nor in Release modes, Sites Reservoir pumping and generation facilities can operate in a pure pump-back mode to participate in shifting excess renewable energy resources (excess wind energy) from off-peak to on-peak hours, provide renewable integration services needed to firm-up renewable energy resources in both the on-peak and off-peak hours, and reduce overall GHG emissions for the California electrical grid. In a pure pump-back operation mode, water would be released from Sites Reservoir into Holthouse Reservoir during the on-peak (or super peak) hours to generate energy and would be pumped back into Sites Reservoir in the off-peak hours to complete the pump-back cycle. The pump-back operation could be superimposed on the Diversion and Release modes when the energy market economics relative to the Sites Pumping/Generating Plant's efficiency (cycle efficiency) are conducive to do that. At Sites Reservoir, the extent of the pure pump-back operations, and pump-back incidental to the Project diversion and release modes, would be driven by market economics, pumping-generating cycle efficiency, residual pumping capacity, residual generation capacity, and residual storage capacity in Holthouse Reservoir.

It is important to note that Project power operations is likely to be designed to first sustain water delivery objectives, and then to choose whether the residual pumping–generating capacity could be offered in the energy and/or in the ancillary markets (including renewable integration services).

Power delivered to or taken from the Project would be transmitted over the interconnected transmission system through one or more interconnection points. Any one or a combination of the four high-voltage transmission lines that are located near the Project could interconnect with the Project to move power into or out of the Project. A transmission system impact study, conducted by the transmission system owner or owners, would be needed to determine the optimal interconnection costs, as well as to identify potential reliability problems that may be caused by the interconnection, and potential system upgrades needed to mitigate the impact of the new interconnection.

Because of the already highly limited capability of transferring additional power between northern and southern California, the effects of Project operations would occur primarily north of the Path 15 transmission line in central and northern California. This region also effectively represents the service area of the CVP. However, as is shown in the modeling conducted to date as part of analyzing the effects of Project operations on the overall power system, detailed in Section 31.3.4.2, the water operation of the Project would also have a ripple effect on energy use in all of California.

For example, the Project would act as an additional storage facility, up to 1.8 MAF, much like the 2-MAF San Luis Reservoir. During drought years especially, the increased storage would increase operations of several pumping plants as water would be released to the Sacramento River and into the Delta, where it would be pumped into the California Aqueduct and the Delta-Mendota Canal, and on through the SWP or CVP pumping stations to projects' service areas throughout central and southern California. Any increased storage in northern California would have the same effect: increased flexibility and quantity in storage would allow or cause increased operations of all pumping plants, including at the SWP's Lake Oroville/Thermalito Complex, where the increased storage of the Project may allow increased pump-back operations there. Increased storage would lead to increased pumping throughout the SWP because of the increased amount of water available to help meet demand while operating within existing environmental restrictions. Increased storage could also lead to increased generation from the SWP and CVP powerhouses from water releases in general.

The diversions from the Sacramento River into Holthouse Reservoir would occur when water is available for diversion. Pumping into Sites Reservoir from Holthouse Reservoir would occur mostly during off-peak hours. From a power perspective, the Project's pumping load would use excess renewable energy (wind energy), and/or excess capacity from fossil generation units. As a result, the Project would shift renewable energy generated during off-peak hours to on-peak hours. As the modeling for the Project shows, Project pumping and generation for water delivery objectives would be seasonal, with high pumping demand in winter months (December through February) and high generation in summer months.

Pump-back operations would be superimposed on Project operations during periods when the Project is not being operated to meet water delivery objectives, or excess capacities are available and could be better used. The intent would be to optimize Project operations to meet water delivery objectives, and to provide integration services to renewable energy generation plants. The Project represents a medium-sized generator (either 127.6 MW, 130.8 MW, or 141.6 MW, depending upon the alternative), with operations optimized to meet scheduled water releases, and to provide valuable renewable integration services As shown in Tables 31-4 and 31-5, the Project in isolation would represent a large, but mostly off-peak electric load (210 MW to 276 MW, depending upon alternative). This load includes pumping for the water diverted from the Sacramento River to Holthouse Reservoir, including at the T-C Canal (where a new 250-cfs pump would be installed at the Red Bluff Pumping Plant), and at the proposed Delevan Pipeline Intake Facilities. During maximum pumping operations, the Project would have the potential to increase total demand in northern California by as much as 276 MW (181.35 MW at the Sites Pumping/Generating Plant, 65.65 MW at the Delevan Pipeline Intake Facilities, 19.68 MW at the TRR, 6 MW at the Red Bluff Pumping Plant Intake, and 3.39 MW at the GCID Intake).

Table 31-4
Project Maximum Pumping Demand by Alternative

Location	Alternative A	Alternative B	Alternative C
Sites Pumping/Generating Plant	158 MW	181.35 MW	181.35 MW
Delevan Pipeline Intake Facilities	65.65 MW	0 MW	65.65 MW
Terminal Regulating Reservoir	19.68 MW	19.68 MW	19.68 MW
Red Bluff Pumping Plant	6 MW	6 MW	6 MW
GCID Intake	3.39 MW	3.39 MW	3.39 MW
Total	**252.72 MW**	**210.42 MW**	**276.07 MW**

Table 31-5
Project Maximum Generating Capacity by Alternative

Generating Plant	Alternative A	Alternative B	Alternative C
Sites Pumping/Generating Plant	107 MW	121 MW	121 MW
Delevan Pipeline Intake Facilities	10.8 MW	0 MW	10.8 MW
Terminal Regulating Reservoir	9.8 MW	9.8 MW	9.8 MW
Total	**127.6 MW**	**130.8 MW**	**141.6 MW**

Note:
MW = megawatt

Pump-back operations would involve the daily procurement of excess renewable energy and relatively low GHG emissions in the off-peak hours (relatively inexpensive power sources) to pump water from the Holthouse Reservoir up to Sites Reservoir and release water during peak hours to generate power and displace energy with relatively higher GHG emissions. Also, Pump-back operations provide flexible load and generation, and would be used to compensate for rapid changes in electric power demand as well as for changes in power production from variable renewable power sources. Although water delivery and power production are given equal weight in the planning goals for the Project, pump-back power operations would likely be secondary to water delivery operations because of the various restrictions on water operations from contracts and from environmental restrictions, but would be optimized within those restrictions to produce the greatest value to support the California electricity grid through providing renewable energy integration services. Pump-back operations from the afterbay to the forebay of each of the two or three (depending upon the chosen alternative) Project pumping/generating facilities would be possible, but only the Sites Pumping/Generating Plant would be used for daily pump-back operations because of the operational limitations placed on the smaller forebays and afterbays of the other Project pumping/generating facilities.

Table 31-6 shows a summary of a preliminary level analysis performed to assess the benefits from optimizing the Project's hydropower operations, including pump-back operations, so it can participate as an energy storage and renewable integration asset using three renewable integration scenarios, and sustain its intended water delivery objectives.

The maximum direct potential adverse effect on the northern California grid from future Project operations would be the instability of the grid caused by simultaneous starting of all Project pumps at a time when insufficient additional generation and transmission capacity would be available to compensate for the resultant instability put into the grid. When started, motors often initially draw 10 or more times their running current as the motor comes up to speed. Motor control designs and pumping management procedures would ensure that pumps are started sequentially, allowing each to come up to speed before the next pump is started, thus reducing the amount of starting current, and resultant instability. Soft-start and motor-generator technology, such as those used at SWP pumping plants, could also be used to reduce starting currents to minimal levels.

Therefore, with appropriate motor control designs and operating procedures in place, the effective maximum adverse direct effect of the Project would most likely be during periods of maximum pumping when generation reserve margins[8] in northern California are low. Indirectly, during times of high demand for water in southern California, Project water releases would cause increased pumping energy use throughout the SWP, especially during drought periods. Low generation reserve margins can occur during summer months when heat waves cause large increases in air conditioning loads, but also during spring and fall months when many generators are off-line for maintenance, reducing the pool of generators available to meet sudden increases in demand or to compensate for other system disturbances, such as the unexpected loss of a transmission line or large generator.

Table 31-6
Summary of Project Optimized Hydropower Operations, including Pump-back Operations

	Operational Mode	Average Annual Load-Gen	Wind or Solar Used or Shifted	Baseload Used or Displaced	Firming Energy Displaced
		MWh	MWh	MWh	MWh
Alternative A					
Scenario 1					
Excess Wind (80%) + Integration Service (20%)	Pumping	398,677	318,941	0	79,735
Resource Shifting (80%) + Integration Service (20%)	Generation	242,568	194,054	0	48,515
Scenario 2					
Excess Wind (50% + Baseload (30%) + Integration Service (20%)	Pumping	398,677	199,338	119,603	79,735
Resource Shifting (80%) + Integration Service (20%)	Generation	242,568	121,284	72,770	48,515
Scenario 3					
Baseload (80%) + Integration Service (20%)	Pumping	398,677	0	318,054	79,735
Resource Shifting (80% + Integration Service (20%)	Generation	242,568	0	194,054	48,515

[8] Reserve margin is defined as the difference in percentage between the maximum generating capacity available to serve load in the region, and the total power demand in that region.

Table 31-6
Summary of Project Optimized Hydropower Operations, including Pump-back Operations

	Operational Mode	Average Annual Load-Gen	Wind or Solar Used or Shifted	Baseload Used or Displaced	Firming Energy Displaced
		MWh	MWh	MWh	MWh
Alternative B					
Scenario 1					
Excess Wind (80%) + Integration Service (20%)	Pumping	365,728	292,583	0	73,146
Resource Shifting (80%) + Integration Service (20%)	Generation	241,830	193,464	0	48,366
Scenario 2					
Excess Wind (50% + Baseload (30%) + Integration Service (20%)	Pumping	365,728	182,864	109,718	73,146
Resource Shifting (80%) + Integration Service (20%)	Generation	241,830	120,915	72,549	48,366
Scenario 3					
Baseload (80%) + Integration Service (20%)	Pumping	365,728	0	292,583	73,146
Resource Shifting (80%) + Integration Service (20%)	Generation	241,830	0	193,464	48,366
Alternative C					
Scenario 1					
Excess Wind (80%) + Integration Service (20%)	Pumping	421,237	336,990	0	84,247
Resource Shifting (80%) + Integration Service (20%)	Generation	261,060	208,848	0	52,212
Scenario 2					
Excess Wind (50% + Baseload (30%) + Integration Service (20%)	Pumping	421,237	210,619	126,371	84,247
Resource Shifting (80%) + Integration Service (20%)	Generation	261,060	130,530	78,318	52,212
Scenario 3					
Baseload (80%) + Integration Service (20%)	Pumping	421,237	0	336,990	84,247
Resource Shifting (80%) + Integration Service (20%)	Generation	261,060	0	208,848	52,212

Notes:

Load-Gen = Load and Generation
MWh = megawatt-hour

The indirect effects of Project operations on power and energy use, especially during times of high demand for CVP and SWP water releases, are more difficult to identify and assess because of the difficulty in predicting the mix of generating resources that would be available to meet increased power and energy demand, as well as to provide ancillary services to help maintain reliability standards. However, as load increases, less-efficient generation would be added to the mix, to the point that during periods of very high demand, all available power plants would be made available to maintain resource adequacy, including those that are so inefficient that they otherwise remain idle for all but a few days per year. Inefficient power plants also tend to be the oldest and most polluting plants available, and significantly increase systemwide air emissions per MWh when operating.

To help assess the range of potential systemwide effects of the alternatives, DWR and Reclamation have commissioned several modeling efforts that simulate system operations under various scenarios. The modeling conducted regarding the effect of the Project on power operations throughout the CVP and SWP (Appendixes 31A and 31B) show that the increased storage offered by the Project would:

- Increase the flexibility of water operations throughout the year
- Increase operations of all pumped-storage projects in the SWP
- Increase operations of SWP pumping plants due to the increased water releases from the Project

This increased energy use (from the last bullet above) would be offset somewhat by the increased generation available from the Project and from other projects within the CVP and SWP because of the overall increase in water releases. Any overall increase in energy use indirectly caused by the increased storage offered by the Project could be partially offset by the energy or cost savings offered by releasing Project water from storage. Similarly, the increased systemwide flexibility provided by the Project may also allow increased pump-back operations at other facilities, such as at Lake Oroville/Thermalito Complex and San Luis Reservoir/Gianelli.

31.3.3 Evaluation Criteria and Significance Thresholds

Significance criteria represent the thresholds that were used to identify whether an impact would be significant. Appendix G of the *CEQA Guidelines* does not include evaluation criteria related to power production and energy. Appendix F of the *CEQA Guidelines* requires a discussion of the potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy.

Appendix F includes the following goals:

- Decreasing overall per capita energy consumption
- Decreasing reliance on fossil fuels, such as coal, natural gas, and oil
- Increasing reliance on renewable energy sources

The evaluation criteria used for this impact analysis represent a combination of the Appendix F criteria and professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects, as required pursuant to NEPA. An adverse effect on power production and energy would occur if an alternative resulted in a substantial expenditure of energy that was not balanced by corresponding beneficial effects (or would result in a wasteful use of energy), or if it would reduce production of renewable energy within the Extended, Secondary, or Primary study areas. Therefore, for the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities.

- Inefficient, wasteful, or unnecessary consumption of energy during operational activities.

- A substantial reduction in the generation of renewable energy.

Various thresholds have been used in previous NEPA and CEQA investigations of SWP- or CVP-related projects in determining significance. For this analysis, an adverse effect would potentially occur if the construction, operation, or maintenance activities result in a net energy use that exceeds five percent of the No Project/No Action Alternative energy use for CVP and SWP pumping. The average combined CVP and SWP energy use for pumping and delivery of water from the Delta, including storage in San Luis Reservoir, pumping over the Tehachapi Mountains, and recovery of some of this energy at generating stations along the California Aqueduct, is approximately 7,000 GWh per year. Therefore, a five percent increase would be approximately 350 GWh.

Although all facilities for each alternative would be constructed, operated, and maintained to minimize the energy required to pump and transport water through the CVP and SWP, each would require energy. An increase in joint CVP and SWP pumping energy use of more than five percent would suggest a wasteful use of energy resources to move water supplies through the CVP and SWP; however, the increased energy use must be balanced against the beneficial attributes of the flexible generation provided by each alternative. The five percent threshold is, therefore, a trigger requiring additional analysis of adverse and beneficial effects to determine overall significance.

31.3.4 Impact Assessment Assumptions and Methodology

31.3.4.1 Assumptions

The following assumptions were made regarding Project-related impacts (construction, operation, and maintenance impacts) to power production and energy use:

- Direct Project-related construction, operation, and maintenance activities would occur in the Primary Study Area.
- Direct Project-related operational effects would occur in the Secondary Study Area.
- The only direct Project-related construction activity that would occur in the Secondary Study Area is the installation of an additional pump into an existing bay at the Red Bluff Pumping Plant.
- The only direct Project-related maintenance activity that would occur in the Secondary Study Area is the sediment removal and disposal at the two intake locations (i.e., GCID Canal Intake and Red Bluff Pumping Plant).
- No direct Project-related construction or maintenance activities would occur in the Extended Study Area.
- Direct Project-related operational effects that would occur in the Extended Study Area are related to San Luis Reservoir operation; increased reliability of water supply to agricultural, municipal, and industrial water users; and the provision of an alternate Level 4 wildlife refuge water supply. Indirect effects to the operation of certain facilities that are located in the Extended Study Area, and indirect effects to the consequent water deliveries made by those facilities, would occur as a result of implementing the alternatives.
- The existing bank protection located upstream of the proposed Delevan Pipeline Intake/Discharge facilities would continue to be maintained and remain functional.
- No additional channel stabilization, grade control measures, or dredging in the Sacramento River at or upstream of the Delevan Pipeline Intake/Discharge Facilities would be required.
- DWR and Reclamation would operate the Project primarily as a water storage and delivery project, with an additional primary purpose of providing electric power services within the contractual and legal obligations that restrict water operations.

- To the extent possible within constraints imposed by water delivery operations, power operations would be conducted in such a way as to provide maximum value to the California power system. Pump-back power operations would be limited to the Sites Pumping/Generating Plant.
- The direct Project-related adverse impacts on power production and energy use would primarily relate to its demand on electric power, which would be offset by its beneficial effects of producing flexible generation to integrate renewable power on demand and/or on-peak energy.
- Indirect Project-related impacts on power production and energy use include both the displaced energy used for Project pumping and the energy use associated with the changes in water storage and conveyance that the Project would cause. For instance, although the Project could increase demand for electric power for its pumping operations, later release of water in storage could avoid use of other more energy-intensive water sources, such as deep groundwater.

31.3.4.2 Methodology

This analysis examines both adverse and beneficial effects of each alternative, and makes a determination of whether an impact would be significant using the significance criteria listed above, and whether feasible mitigation could avoid, eliminate, reduce, or compensate for a significant impact. To determine overall effects, potential adverse effects were balanced with the potential beneficial effects. To help quantify these effects, DWR and Reclamation have conducted extensive computer modeling of the alternatives to assess the potential benefits and impacts of each, including the No Project/No Action Alternative. The modeling conducted to date for this analysis focused on Project-related operations and the resulting direct and indirect effects within the CVP and SWP systems. The modeling did not attempt to predict all power operations in the WECC, or in all of California, for any alternative.

Whether the alternatives would result in significant impacts to power production and energy was determined based on an assessment of:

- Energy requirements and energy use efficiencies for each stage of the alternative.
- The effects on local and regional energy supplies and on requirements for additional capacity.
- The effects on demands for electricity and other forms of energy.
- The effects of the alternative on other energy resources in particular renewable resources.
- A comparison of the alternatives in terms of overall energy consumption and in terms of reducing wasteful, inefficient, and unnecessary consumption of energy.

To examine the range of potential effects of Project operations on the electric power system in the western U.S., computer modeling of CVP, SWP, and Project power and energy use over a wide range of hydrological conditions was conducted, including multiple Dry years as well as Wet years. This modeling was used in a preliminary analysis of the direct and indirect effects of future Project operations on power and energy use in the Primary, Secondary, and Extended study areas.

The power analysis used spreadsheet post-processors to evaluate the power impacts of flow scenarios from CALSIM II operations studies on a monthly time step. CALSIM II is a planning model developed by DWR and Reclamation that simulates operations of the SWP and CVP and areas tributary to the Sacramento-San Joaquin Delta. CALSIM II provides quantitative hydrologic-based information to those responsible for planning, managing, and operating the SWP and CVP. CALSIM II is typically the system model that is used for any interregional or statewide analysis in California.

The following tools used the monthly output from CALSIM II as input to perform power production and benefits analyses. These tools evaluate facility-specific and systemwide generation, load, and net generation:

- LTGen: analyzes CVP facilities
- SWP_Power: analyzes SWP facilities
- NODOS_Power: analyzes existing and proposed Project facilities

These tools estimated average annual energy generation and use at SWP and CVP facilities and at proposed Project generation and pumping facilities, including existing facilities that would be operated differently if the Project is constructed. For generation facilities, the tools estimated average annual energy generation, as well as average annual peaking power capacity, based on projected reservoir levels. For pumping facilities, the tools estimated average annual energy requirements. The tools also checked to determine whether off-peak energy use targets were met. Transmission losses were estimated for both pumping and generation facilities. The methods, assumptions, and results of the LTGen, SWP_Power, and NODOS_Power spreadsheet models are described in Appendix 31B. A summary description of flow and storage conditions associated with the alternatives, based on the CALSIM II model results, is in Chapter 6. The CALSIM II model description and detailed results are included in Appendix 6B.

Flow and storage levels used in the power analysis tool were taken from CALSIM II studies, using the results of the entire simulation period of October 1921 to September 2003. The monthly time step in CALSIM II is not sufficiently granular to evaluate the on-peak and ancillary service benefits associated with a daily pump-back operation. The CALSIM II data was disaggregated to model the daily-pump back feature to optimize generation benefits and minimize the cost of pumping. DWR’s Power and Risk Office (PARO) performed two studies. The first phase study (Phase 1) was completed in 2009, in which the designed capacities and the corresponding operational scenarios for the Project’s components were analyzed, and some design modifications were recommended. The second phase study (Phase 2) analyzed the three alternatives identified for the Project, relative to the No Project/No Action Alternative, and to optimize power operations (with sustained water operations) to better capture power market opportunities and use the inherent excess capacities (resulting from hydrology swings) for the different components of the Project. The full Phase 1 and Phase 2 reports are included in Appendix 31A.

The analysis of each alternative also included consideration of direct adverse and beneficial effects from Project operations on electric power use and production. Adverse effects include:

- Displaced use of CVP or SWP power for Project pumping operations.
- Increased pumping throughout the CVP and SWP system, especially during drought years, due to the increased storage available at Sites Reservoir.
- Increased competition for off-peak network power purchases for Project pumping operations.

Beneficial effects include:

- Increased use of excess renewable energy (especially wind energy) to serve Project’s pump loads during off-peak hours.
- Increased peak power generation and flexibility from Project pump-back power production during peak hours.

- Increased availability of ancillary services from Project operations, including firming other renewable power resources, such as wind and solar power, as well as spinning and non-spinning reserves, frequency support, voltage support, and load-following.
- Increased flexibility of water operations throughout the SWP and CVP may allow increased use of pump-back operations at other facilities to maximize revenues, and increasing the ability to meet contract obligations while maintaining required environmental standards.

These direct effects could cause a ripple effect throughout the SWP and CVP, as well as the PG&E and WAPA transmission systems and the interconnected electric utility system in California and beyond, creating indirect effects as utilities, other generators, and large end-users adjust to the changes in market pricing and availability caused by Project operations. For example, direct effects would include changes in pumping power usage to move Project-stored water to some SWP and CVP service areas. Indirect effects could include a need to construct additional power system infrastructure to compensate for the loss of access to CVP power. The increased availability of peak power created by the Project could avoid the need to construct other infrastructure, such as a gas-turbine peaker plant.

31.3.5 Topics Eliminated from Further Analytical Consideration

No Project facilities or topics that are included in the significance criteria listed above were eliminated from further consideration in this chapter.

31.3.6 Impacts Associated with the No Project/No Action Alternative

31.3.6.1 Extended Study Area – No Project/No Action Alternative

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. The impacts of these projects have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for inefficient, wasteful, or unnecessary power production and energy has been addressed in those environmental documents. Therefore, **there would not be a substantial adverse effect**, when compared to Existing Conditions**.**

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

If the No Project/No Action Alternative is implemented, the Project would not be built, and there would be no direct increase in demand for electric power due to the Project, nor would the benefit of additional storage be available, and therefore, no additional pumping through the SWP would occur. Electric power demand and energy use throughout the Extended Study Area would continue to slowly increase as the population increases, and regulatory agencies and investor-owned and consumer-owned utilities would continue to plan and construct improvements to their systems to ensure reliability standards are maintained. Overall, the No Project/No Action Alternative would likely result in a moderately increased overall demand for electric power in the western U.S. when compared to Existing Conditions (2009), due to load growth caused by an increased population. Total maximum electric demand in the western U.S. and Canada would increase from approximately 148,000 MW in 2009, to 159,000 MW in 2014, and to 168,000 MW in 2019. Generation reserve margin (defined as the percentage that total available electric generating capacity exceeds electric demand) in the western U.S. and Canada in 2009 was approximately 29 percent; projected reserve margin in summer 2014 is 39 percent, and for summer 2019 is 33 percent, indicating that sufficient generating capacity would be available to accommodate any new loads added to the system during that time frame (NERC, 2010).

If the No Project/No Action Alternative is implemented, the facilities and operations of the SWP and CVP would continue to be similar to Existing Conditions with the following changes:

- An increase in demands and build-out of facilities associated with CVP contracts of approximately 253,000 acre-feet per year north of the Delta at the future level of development. This is a result of an increase in CVP M&I service contracts related primarily to urban M&I use within the American River Basin (198,000 acre-feet), especially in the communities in El Dorado, Placer, and Sacramento counties.
- An increase in demands associated with SWP contracts, up to full contract amounts, south of the Delta at the future level of development. SWP demands, which under the existing level of development, vary on hydrologic conditions between 3.0 to 4.1 MAF per year, would be at maximum contract amounts in all hydrologic conditions under the No Project/No Action Alternative. This represents a potential 25 percent increase on average in south of the Delta demands pursuant to SWP contracts between existing and future levels of development.
- An increase in non-Project water rights demand of 184,000 acre-feet in the American River Basin.

New urban intake/Delta export facilities include:

- Freeport Regional Water Project
- City of Stockton Delta Water Supply Project
- Delta-Mendota Canal–California Aqueduct Intertie
- Contra Costa Water District Alternative Intake Project and Los Vaqueros expanded storage capacity (160 TAF)
- South Bay Aqueduct rehabilitation, to 430 cfs capacity, from its junction with the California Aqueduct to Alameda County FC&WSD Zone 7

An increase in supplies for Wildlife Refuges including Firm Level 2 supplies of approximately 8,000 acre-feet per year, and Level 4 supplies of approximately 50,000 acre-feet per year at the future level of development. However, Firm Level 2 supplies would be met by CVP contract supply and Level 4 supplies would be met through local water acquisitions in both existing and future levels of development.

For the power sector, new infrastructure would be constructed, as necessary, to maintain reliability standards, and would likely consist of a mixture of transmission system upgrades and development of a diverse mixture of generating resources, especially renewable energy resources as required by the Renewable Portfolio Standards (RPS) mandated by state law, and resources capable of rapid ramp-up and ramp-down operations to more easily accommodate the variable generation of solar and wind generation. Similarly for the water sector, the various agencies and companies involved in water system planning would continue to plan and construct system improvements to ensure adequate water sources are available to meet the demands of their customers and constituents.

Predicting exact infrastructure development for the No Project/No Action Alternative would be speculative; therefore, an assessment of potential impacts of future infrastructure development is not possible or practical at this time. This is due to the uncertainties of future power demand and supplies, although sufficient generation reserve margin is predicted through at least 2019 to accommodate reasonably foreseeable increased demand in electric power or energy. Similarly, predicting the water-related infrastructure development that would occur in the absence of the Project is also difficult. Southern California especially faces significant challenges in retaining existing or obtaining new water supply resources; and although demand for water has remained flat throughout the 1990s and 2000s (through aggressive conservation and efficiency programs and standards), maintaining the current or projected level of supply in the future is uncertain. Lowering aquifer levels in many areas of the State caused by overpumping and/or reduced recharge means that groundwater pumping energy use, and related costs, would likely continue to increase as water is pumped from deeper and deeper depths. Other geographic areas of the State are considering the use of desalination, which is also an energy intensive alternative, as a future supply option. State water policy currently calls for a 20 percent reduction in urban water and associated energy use by the year 2020 (DWR et al., 2010), and effective efficiency and conservation programs would likely continue to be the least-cost alternative to addressing future demand increases or supply reduction; but it is also likely that many water agencies would develop infrastructure to access existing or new water resources, or to improve existing resources, such as through groundwater recharge programs. The construction, operational, and maintenance-related impacts of these projects would be evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for impacts to power levels would be addressed in those environmental documents.

Table 31-7 provides a summary of the predicted changes in power and energy use in CVP, SWP and other related facilities if the No Project/No Action Alternative is implemented. The modeling for the Project using the CALSIM II model of CVP and SWP water and power operations (Appendixes 31A and 31B) shows that net generation and energy use at the CVP,SWP and other related facilities would remain at approximately the same levels for the No Project/No Action Alternative as for Existing Conditions, although the long-term average net generation for all existing facilities is expected to decline from plus 51 GWh to minus 132 GWh because of changes in water operations, as described above. The modeling predicts modest changes in energy use and generation for this alternative when compared to Existing Conditions, although power costs are expected to continue to rise, such that long-term power costs for the SWP pumping plants are expected to increase by nearly 50 percent by 2025 if the No Project/No Action Alternative is implemented, even though actual energy use would increase by only three percent, and therefore, does not meet the five percent threshold requiring additional analysis of energy and power use impacts.

Table 31-7
CVP, SWP, and Other Related Facilities Energy Use (in GWh)[a] – No Project/No Action Alternative

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	No Project/No Action Alternative minus Existing Conditions
CVP Facilities				
Energy Generation	Long-Term[b]	4,712	4,701	-11
	Dry and Critical[c]	3,533	3,513	-20
Energy Use	Long-Term	1,124	1,116	-9
	Dry and Critical	894	878	-16

Table 31-7
CVP, SWP, and Other Related Facilities Energy Use (in GWh)[a] – No Project/No Action Alternative

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	No Project/No Action Alternative minus Existing Conditions
Net Generation[d]	Long-Term	3,588	3,585	-2
	Dry and Critical	2,639	2,635	-4
SWP Facilities				
Energy Generation	Long-Term	4,326	4,386	59
	Dry and Critical	3,033	2,909	-124
Energy Use	Long-Term	7,848	8,088	239
	Dry and Critical	6,354	6,013	-340
Net Generation	Long-Term	-3,522	-3,702	-180
	Dry and Critical	-3,321	-3,104	217
Other Related Facilities[d]				
Energy Generation	Long-Term	0	0	0
	Dry and Critical	0	0	0
Energy Use	Long-Term	13	13	0
	Dry and Critical	11	12	0
Net Generation	Long-Term	-13	-13	0
	Dry and Critical	-11	-12	0
All Facilities (CVP, SWP, and Other Related Facilities)[e]				
Energy Generation	Long-Term	9,038	9,087	48
	Dry and Critical	6,566	6,422	-144
Energy Use	Long-Term	8,983	9,214	231
	Dry and Critical	7,257	6,901	-356
Net Generation	Long-Term	51	-132	-183
	Dry and Critical	-694	-482	212

[a]Results are estimated using LTGEN, SWP_Power, and NODOS_Power using data from the CALSIM II model.
[b]Long-Term is the average quantity for the calendar years 1922 to 2002.
[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
[d]Other Related Facilities include Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities.
[e]Energy Use and Net Generation for all facilities does not equal sum of Energy Use and Net Generation for CVP, and SWP, and proposed Other Related Facilities because energy use at Red Bluff Pumping Plant (RBPP) is included in both CVP and Other Related Facilities. Results for RBPP from LTGEN are subtracted from Energy Use and Net Generation for all facilities to avoid double-counting.

Notes:

CVP = Central Valley Project
GWh = gigawatt-hours
SWP = State Water Project

The No Project/No Action Alternative would not support the CEQA Appendix F goals of decreasing per capita energy consumption, decreasing reliance on fossil fuels, and increasing reliance on renewable energy resources, when compared to Existing Conditions. Additional infrastructure would likely be constructed to meet reliability standards, and to allow better integration of variable renewable energy resources into the grid. Projected generation reserve margins indicate that sufficient generation resources would be in place for any increase in demand in any area of the western U.S., and the present planning process that is in place to assure reliability standards are met has proved effective in planning and implementing needed system improvements.

Although the exact nature of future infrastructure development is uncertain, the power and water resource and reliability planning regime currently in place would continue to ensure that utility infrastructure and resources would be sufficient to meet reliability standards, and that all infrastructure and generating capacity built would comply with all applicable laws, ordinances, regulations, and standards; therefore, the No Project/No Action alternative is not expected to result in inefficient, wasteful, or unnecessary energy use and **would not have a substantial adverse effect**, when compared to Existing Conditions**.**

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

The No Project/No Action alternative is not expected to result in a reduction in the generation of renewable generation. The RPS requirement for renewable energy purchases by the State's electric utilities would continue to drive development and integration of renewable energy generation, and the current system reliability processes would ensure that sufficient infrastructure is in place to compensate for the variable nature of solar and wind generation. Therefore, **there would not be a substantial adverse effect** to power production or energy use in the Extended Study area, when compared to Existing Conditions.

31.3.6.2 Secondary Study Area – No Project/No Action Alternative

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

Refer to the **Impact Power-1** discussion for the Extended Study Area. The discussion also applies to the Secondary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

The effects of the No Project/No Action Alternative on power production and energy use, when compared to Existing Conditions in the Secondary Study Area, would be similar to that described for the Extended Study Area.Total maximum load in California in 2009 was approximately 59,000 MW, with a generation reserve margin of approximately 28.5 percent; projected California load in 2014 is 61,621 MW, with a generation reserve of 60.3 percent; and projected California load in 2019 is 64,655 MW, with a generation reserve of 53 percent (NERC, 2010). Similar to that described for the Extended Study Area, predicting exact infrastructure development if the No Project/No Action Alternative is implemented would be speculative. Similar to that for the Extended Study Area, the computer modeling effort that was conducted predicts that net SWP/CVP energy use would not increase by five percent or more in the Secondary Study Area if the No Project/No Action Alternative is implemented, and therefore, does not meet the threshold for requiring additional analysis for significance. Therefore, with sufficient planning, the No Project/No Action alternative is not expected to result in inefficient, wasteful or unnecessary energy use, and **would not have a substantial adverse effect.**

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Refer to the **Impact Power-3** discussion for the Extended Study Area. The discussion also applies to the Secondary Study Area.

31.3.6.3 Primary Study Area – No Project/No Action Alternative

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

Refer to the **Impact Power-1** discussion for the Extended Study Area. The discussion also applies to the Primary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Total maximum load in northern California in 2009 was approximately 25,000 MW, with a generation reserve margin of approximately 23.5 percent; projected northern California load in 2014 is 26,645 MW, with a generation reserve of 48.7 percent; and projected northern California load in 2019 is 27,502 MW, with a generation reserve of 39.5 percent. Similar to that for the Extended and Secondary study areas, sufficient generation reserve margin in the Primary Study Area is predicted through at least 2019, and the power resource and reliability planning regime currently in place would continue to ensure utility infrastructure and resources would be sufficient to meet reliability standards. Therefore, the No Project/No Action Alternative is not expected to result in inefficient, wasteful or unnecessary energy use, and **would not have a substantial adverse effect.**

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Refer to the **Impact Power-3** discussion for the Extended Study Area. The discussion also applies to the Primary Study Area.

31.3.7 Impacts Associated with Alternative A

31.3.7.1 Extended Study Area – Alternative A

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

If Alternative A is implemented, Project construction, maintenance, and recreation activities within the Extended Study Area would not occur, resulting in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

When compared to Existing Conditions, Alternative A would result in a net increase in maximum demand in the Extended Study Area of approximately 253 MW for Project pumping power, and a net increase in generating capacity of 127.6 MW. When compared to the No Project/No Action Alternative, the net change in demand and generation caused by implementation of Alternative A would likely be approximately the same, based on normal load growth and the processes in place to ensure sufficient water supply and electric power generation and transmission capacity remain in place to meet reliability standards.

The Project's water operation and pump-back operations would be optimized to maintain the best and efficient use of Project's pumping and generating assets. Most pumping from Holthouse Reservoir into Sites Reservoir would be done during off-peak and shoulder hours when power demands (and power prices) are low. During these periods, it is anticipated that there would be an excess in wind generation and there would be a need for load to keep combined cycle gas generation units (low GHG emissions) at the minimum allowed generation. Water stored in Sites Reservoir would represent stored energy in the context of power operations of the Project. Stored water (i.e., energy) would be released through Project generating facilities during on-peak and super-peak hours, either on a seasonal basis to meet water delivery objectives, or on a daily basis to meet pump-back power operations objectives. Either way, the generated power would likely displace single-cycle gas generation units. The net result is that the Project could help to lower overall GHG emissions from the generating sector by shifting cleaner/lower GHG emission resources from the off-peak hours to the on-peak hours. Although the Project would be a net energy consumer, Project operations, when optimized, would have a positive effect in integrating renewable energy resources and lower overall energy market's GHG emissions.

Power would be procured for Alternative A pumping operations from CAISO or WAPA, including power needed for pump-back operations. The increased demand caused by Alternative A pumping would be partially offset by the generating capacity from Alternative A power operations.

Maximum electric demand for Alternative A pumping would equal approximately 0.17 percent of the total 2009 electric demand in the Western Interconnection, and would reduce generation reserve margin by that amount during maximum pumping operations. Alternative A pumping load would be approximately 0.16 percent of total load in that region in 2019. When operated at maximum generating capacity, the Alternative A would add approximately 0.07 percent to the 2009 generation reserve in the same region; it would add approximately 0.06 percent in 2019.

When compared to the entire Western Interconnection, this increase in demand or generation would not be significant, although the addition or sudden loss of Alternative A pumping load or generation could have a ripple effect on the interconnected grid in the western U.S. and Canada, potentially creating cascading reliability problems similar to what occurred during the 1996 electric blackouts in the western U.S. and Canada, where faults occurring in Montana and Idaho created blackouts in California and other parts of the West.

The timing of power use and generation is also important. Project modeling indicates that Alternative A-related pumping would occur mostly in winter months, with lesser amounts into spring and early summer. The modeling also predicts that high generated power levels at the Project would occur mostly during summer months, when water is released to meet CVP and SWP obligations. This matches well for northern California's power system, which has peaks in power and energy use in summer months during periods of high air conditioning demand, and generally has significantly lower demand in winter months.

Alternative A water operations, however, would have a ripple effect on power use and generation throughout the CVP and SWP system, as is examined in the Project modeling that is summarized in Appendixes 31A and 31B. Alternative A water releases in summer months can be partially moved as far as southern California through SWP canals and pumping stations, causing increased energy use at all affected pumping plants.

As shown in Table 31-8, the modeling results for implementation of Alternative A indicate relatively modest effects on generation reserves, and modest increases in energy use of the CVP and SWP as a result of adding the Project facilities to their systems, as would be expected for any increase in water storage in northern California. Table 31-8 does not show the increase in ancillary service production, which would serve to increase system reliability. When considered alone, the energy use by Alternative A would not exceed the 350 GWh trigger requiring additional analysis, whether compared to Existing Conditions and the No Project/No Action Alternative.

Table 31-8
CVP, SWP, and Proposed Project Facilities Energy Use (in GWh)[a] – Alternative A

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	Alternative A	Alternative A Minus Existing Conditions	Alternative A Minus No Project/No Action Alternative
CVP Facilities						
Energy Generation	Long-Term[b]	4,712	4,701	4,711	-1	11
	Dry and Critical[c]	3,533	3,513	3,500	-34	-13
Pumping Energy Use	Long-Term	1,124	1,116	1,152	27	36
	Dry and Critical	894	878	902	8	24
Net Generation[d]	Long-Term	3,588	3,585	3,560	-28	-25
	Dry and Critical	2,639	2,635	2,598	-41	-37
SWP Facilities						
Energy Generation	Long-Term	4,326	4,386	4,491	165	105
	Dry and Critical	3,033	2,909	3,143	110	234
Pumping Energy Use	Long-Term	7,848	8,088	8,442	594	354
	Dry and Critical	6,354	6,013	6,768	414	755
Net Generation	Long-Term	-3,522	-3,702	-3,951	-429	-249
	Dry and Critical	-3,321	-3,104	-3,625	-304	-521
Proposed Project Facilities[d]						
Energy Generation	Long-Term	0	0	126	126	126
	Dry and Critical	0	0	129	129	129
Pumping Energy Use	Long-Term	13	13	229	217	216
	Dry and Critical	11	12	184	172	172
Net Generation	Long-Term	-13	-13	-103	-90	-90
	Dry and Critical	-11	-12	-54	-43	-43
All Facilities (CVP, SWP, and Proposed Project)[e]						
Energy Generation	Long-Term	9,038	9,087	9,329	290	242
	Dry and Critical	6,566	6,422	6,771	206	350
Pumping Energy Use	Long-Term	8,983	9,214	9,818	835	604
	Dry and Critical	7,257	6,901	7,850	592	948
Net Generation	Long-Term	51	-132	-499	-550	-367
	Dry and Critical	-694	-482	-1,085	-391	-603

[a]Results are estimated using LTGEN, SWP_Power, and NODOS_Power using data from the CALSIM II model.

[b]Long-Term is the average quantity for the calendar years 1922 to 2002.

[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.

[d]Proposed Project Facilities include Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities.

[e]Energy Use and Net Generation for all facilities does not equal sum of Energy Use and Net Generation for CVP, SWP, and Project facilities because energy use at Red Bluff Pumping Plant (RBPP) is included in both CVP and Project facilities. Results for RBPP from LTGEN are subtracted from Energy Use and Net Generation for all facilities to avoid double-counting.

Notes:

CVP = Central Valley Project
GWh = gigawatt-hours
SWP = State Water Project

However, by making up to 1.27 MAF of additional storage available to the water system, water releases from Alternative A would lead to increased use of energy for pumping the released water as far as southern California. According to the modeling results, the net CVP and SWP energy use increase caused by Alternative A (energy use minus energy production) would be as much as 550 GWh more than Existing Conditions and as much as 367 GWh more than the No Project/No Action Alternative, both of which are above the threshold requiring additional analysis. When compared to 2009 total electrical energy use of 858,793 GWh in the Extended Study Area, and projected 2019 energy use of more than 1 million GWh, the increased energy use caused by Alternative A in 2025 would be 0.04 percent of the projected total electrical energy use in the Extended Study Area. However, Alternative A would also create beneficial effects, such as increasing the flexibility of both the electric system and water system in California in meeting demand and maintaining reliability standards, due to the power and ramping capability that Alternative A would create. Project facilities would be designed and built to the maximum feasible efficiency, and both water and power operations would provide considerable benefit to the citizens of the State; therefore the energy used to store water would not be considered an inefficient, wasteful, or unnecessary use of energy because it would be used to store water and potential electric energy for later use when needed. This would result in **no impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

For the Project, and in addition to the aforementioned seasonal operational profile, pumping-generating assets would be optimized on daily basis to better use and synchronize the Project's facilities with power market opportunities (e.g., prices, ancillary services). The optimized operations would shift all pumping from Holthouse Reservoir to Sites Reservoir to off-peak and shoulder hours, and would shift all water releases and incidental power generation to super-peak and on-peak hours. The benefits from optimized operations of the Project would not only enhance the economics of the Project (minimize net energy costs), but would also make the Project's facilities available to superimpose a pump-back operation cycle on Project operations. It is important to note that through pump-back operations, the Project would be able to offer renewable integration services to the grid and would reduce the overall GHG emissions through shifting excess renewable energy from off-peak hours to on-peak hours. This would, therefore, displace on-peak high GHG emissions generating assets, such as single-cycle combustion turbines.

Alternative A would not likely decrease per capita energy consumption in the Extended Study Area, but would promote increased reliance on renewable resources, decreased reliance on fossil fuels, and reduce greenhouse gas emissions by displacing high emission peaking power plants due to its ability to assist integration of variable renewable power resources, such as wind and solar. Therefore, Alternative A is expected to promote the use of renewable energy, and would not cause a reduction in generation of renewable energy. Therefore, operation of Alternative A would result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.7.2 Secondary Study Area – Alternative A

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The only use associated with the Project that would occur in the Secondary Study Area, but not in the Primary Study Area, is that associated with the installation and operation of a pump at the Red Bluff

Pumping Plant. Installing the proposed pump into an existing bay at the existing Red Bluff Pumping Plant would require the direct and indirect use of energy resources. Direct energy use would involve using petroleum products and electricity to operate construction and maintenance equipment, as well as fuel use by workers commuting to and from the Project site. Indirect energy use would involve the consumption of energy to extract raw materials to manufacture the pump and construction/maintenance equipment and vehicles, and to transport the pump. These activities would require the use of gasoline and diesel fuel.

Project construction activities would temporarily increase energy consumption during the Project construction period, when compared to Existing Conditions. No substantial long-term energy use would be required for the installation of the pump as part of Alternative A. Also, it is not anticipated that such energy use would be inefficient, wasteful, or unnecessary. This impact is considered to be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Various types of fuel-consuming equipment would be necessary for maintenance of the pump (including routine inspections and repairs); however, this additional energy use would be relatively minor when compared to overall maintenance energy use at the facility that currently occurs (i.e., Existing Conditions) and the No Project/No Action Alternative, and the energy usage would be temporary and intermittent. Also, it is not anticipated that such energy use for Project maintenance would be inefficient, wasteful, or unnecessary because it would ensure that the pump would continue to operate properly for its designed life cycle. Impacts to power and energy use related to Project maintenance would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative. In addition, no Project Recreation Areas would be constructed within the Secondary Study Area if Alternative A is implemented, resulting in **no impact** on power and energy use in the Secondary Study Area for Recreation Area maintenance and use, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Although Alternative A power operations would have some effects across the Western Interconnection, its major effects would occur in California, due to its effect on CVP and SWP operations. Maximum electric energy demand for Alternative A pumping would equal approximately 0.43 percent of the total 2009 electric demand in California, and may reduce reserve margin by that amount only if pumping occurs during super peak hours. Alternative A pumping demand would represent approximately 0.41 percent of total projected demand in 2014, and 0.39 percent of total demand in 2019. When operated at maximum generating capacity, the Alternative A would add approximately 0.17 percent to the 2009 generation reserve in the same region. In comparison to the all of California, this increase in demand or generation would not be significant.

When compared to 2009 total electrical energy use of 285,913 GWh in the Secondary Study Area (California), and projected 2019 energy use of 321,649 GWh, the increased energy use caused by Alternative A in 2025 (390 GWh) would be 0.14 and 0.12 percent, respectively, of the projected total electrical energy use in the Secondary Study Area. Similar to that for the Extended Study Area, the energy use of Alternative A would not be considered inefficient, wasteful, or unnecessary, and the water stored through that energy use would provide substantial benefits both to power and energy use and to water resources, resulting in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Regarding the power and energy use goals set forth in Appendix F of the *CEQA Guidelines*, Alternative A would not decrease per capita energy consumption in the Secondary Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Therefore, the Project is expected to promote use of renewable energy, and would not cause a reduction in generation of renewable energy. Operation of Alternative A would result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.7.3 Primary Study Area – Alternative A

Construction, Operation, Maintenance, and Recreation Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

Power production and energy use within the Primary Study Area during Project construction and/or maintenance activities, and during recreation use, is not expected to be inefficient, wasteful, or unnecessary if Alternative A is implemented.

The proposed modification or demolition of existing facilities, as well as the construction of new facilities, would require the direct and indirect use of energy resources. Direct energy use would involve using petroleum products and electricity to operate construction equipment, such as trucks, bulldozers, and tunnel boring equipment, as well as fuel use by workers commuting to and from the Project sites. Indirect energy use would involve consuming energy to extract raw materials, manufacture construction equipment and materials, and transport the goods necessary for construction and maintenance activities. These activities would require the use of gasoline and diesel fuel.

The use of fuel-consuming equipment during Project construction would increase energy consumption from Existing Conditions temporarily during the Project construction period. No long-term energy use would be required for construction of Alternative A. Also, it is not anticipated that such energy use would be inefficient, wasteful, or unnecessary. This impact would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Various types of fuel-consuming equipment would be necessary for maintenance of all proposed Project facilities (including routine inspections and repairs), such as sediment removal/dredging, and for maintenance and use of the Recreation Areas. Work conducted during maintenance activities would be relatively minor, when compared to overall energy use in the Primary Study Area for Existing Conditions and the No Project/No Action Alternative, and the energy usage would be temporary and intermittent. Also, it is not anticipated that such energy use would be inefficient, wasteful, or unnecessary because it would ensure that the facilities would continue to operate properly for their designed lifetimes, and would provide benefits to the State. Depending on the activity undertaken at the Recreation Areas, recreation use may require energy in the form of electricity and/or gas; this would also be temporary and intermittent. Impacts to power and energy use related to Project maintenance and recreational use would, therefore, be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Other than for Project pumping, energy use during Project operations would be minimal, limited to lighting and potable water pumping proposed for the Stone Corral and Peninsula Hills recreation areas, and the lighting of Project facilities. These areas would use minimal amounts of energy on an ongoing basis, when compared to Project pumping, and do not reach the trigger thresholds requiring additional analysis. Therefore, impacts to power and energy use at the Stone Corral and Peninsula Hills recreation areas, and the lighting of Project facilities would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Maximum electric demand for Alternative A (252.7 MW) would equal approximately 1.0 percent of the total 2009 electric demand in northern California, and would reduce generation reserve margin by that amount in the State during maximum pumping operations. Alternative A pumping demand would be approximately 0.95 percent of total demand in the region 2014, and 0.92 percent of total demand in 2019. When operated at maximum generating capacity, Alternative A would add approximately 0.41 percent to the 2009 generation reserve in the same region; Alternative A would add a projected 0.32 percent of total northern California generation capacity in 2014, and 0.33 percent in 2019.

A preliminary transmission interconnection feasibility analysis conducted in 2007 concluded that power flows expected for Alternative A, using the assumptions at that time, could be accommodated within the then-existing transmission system, with no upgrades, without creating reliability impacts in the Primary Study Area. Three Interconnection Configuration Alternatives were considered for power flow analysis and cost estimating:

- Interconnect to PG&E's (then-proposed but now operating) Colusa 230-kV Switching Station via a 1-mile 230-kV transmission line
- Interconnect by looping onto PG&E's 230-kV transmission line from the then-proposed Colusa Switching Station to Vaca-Dixon 230-kV substation, circuit #3
- Interconnect by looping onto WAPA's Olinda - Obanion 230-kV transmission line

Power flow analysis showed that all three interconnection points had acceptable NERC/WECC Category A, B and C performance and the Project would not cause any criteria violations. The results of the power flow analysis did not identify a preferred interconnection alternative because all three were feasible and would not require any associated transmission network upgrades (USE, 2007).

By making up to 1.27 MAF of additional storage available to the water system, water releases from Alternative A could lead to increased use of energy. Adverse energy use effects from Project operations are likely to be very small when compared to total energy use in the Primary Study Area. The modeling projects up to a 550-GWh increase per year in energy use by CVP and SWP facilities with implementation of Alternative A, when compared to Existing Conditions and the No Project/No Action Alternative. The increase in energy consumption would be less than 1 percent of 2009 total electrical energy use of 124,405 GWh in the Primary Study Area (northern California), and projected 2019 energy use of 140,378 GWh. The increased CVP and SWP energy use caused by Alternative A in 2025 and 2060 would be 0.29 and 0.26 percent, respectively, of the 2009 and projected 2019 total electrical energy use in the Primary Study Area.

This net increase in power and energy use would likely be accommodated by proper planning, especially given the projected large generation margins in the region. However, operation of Alternative A could cause changes in energy production and transmission patterns that could lead to localized effects, such as a need to build additional infrastructure to compensate for changes in power flows. Determining the future need for new infrastructure due to direct or indirect effects of Alternative A operations would be speculative, given the changes that are likely to happen before Alternative A could be operational. However, all future infrastructure additions would be subject to environmental review by the approving agency, thereby assuring that the environmental effects of such addition would be fully analyzed, with appropriate mitigation imposed for all identified significant impacts.

Alternative A would offer as a benefit to the electric power system in northern California the ability to effectively store energy through pump-back operations. Currently, pumped-storage hydroelectric projects are among the best available technologies to store energy on a large scale, using surplus power during times of low cost to pump water to a higher elevation for later release, with accompanying power production, during times of high demand and high cost.

When compared to all of northern California, the increase in power and energy use caused by Alternative A operations would likely result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative, and would not be inefficient, wasteful, or unnecessary when considering the benefits that Alternative A would offer to the electric power system in northern California.

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Alternative A power capabilities would also offer benefits to the system through its ability to firm up the generation of renewable power resources in the region, and especially for solar- and wind-powered resources. It would also offer benefits through its capability to provide ancillary services to the grid. Alternative A power operations would bring stability to the grid by providing the ability to quickly ramp power generation up or down to balance sudden unexpected changes in solar and/or wind generation and compensate for uncertainties in load forecasts (water operations are a primary objective). Alternative A operations could provide ancillary services to the grid in the Primary Study Area by curtailing power use for pumping (up to 253 MW in essentially instantaneous reduction for Alternative A), as well as by ramping up power production (up to 127.6 MW).

Similar to that for the Secondary Study Area, Alternative A would not likely decrease per capita energy consumption in the Primary Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Operation of Alternative A would, therefore, result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.8 Impacts Associated with Alternative B

31.3.8.1 Extended Study Area – Alternative B

Construction, Operation, Maintenance, and Recreation Use Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative B as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Extended Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Impacts on power production and energy use if Alternative B is implemented are expected to be similar to those described for Alternative A, except that Alternative B would have a somewhat reduced total electric demand for Project pumping operations (210 MW instead of 253 MW), and a somewhat higher generating capacity (131 MW instead of 128 MW). When compared to Existing Conditions, Alternative B would result in a net increase in maximum demand in the Extended Study Area of approximately 210.4 MW for Project pumping power, and a net increase in generating capacity of 130.8 MW. However, the net change in demand and generation caused by development of Alternative B would likely be approximately the same as for Existing Conditions and the No Project/No Action Alternative, based on normal load growth and the processes in place to ensure sufficient water supply and electric power generation and transmission capacity are available to meet system requirements.

Table 31-9 summarizes the modeling results of the CVP and SWP systemwide effects of Alternative B, showing the resultant changes in energy use throughout both systems. Table 31-9 does not show the increase in ancillary service production, which would serve to increase system reliability. The overall effect of Alternative B would be a somewhat reduced effect on total power and energy use, when compared with Alternative A. Regarding generation, because of the increased Sites Pumping/Generating Plant generating capacity due to higher Sites Reservoir level (121 MW for Alternative B versus 107 MW for Alternative A) offset by the lack of the Delevan Pipeline powerhouse (0 MW for Alternative B versus 10.8 MW for Alternative A), Alternative B would result in a small increase in renewable generating capacity (3.2 MW) when compared to Alternative A. Because the adverse impacts on power production and energy use associated with Alternative B would be less than for Alternative A, and the benefits offered would be equal to or greater than for Alternative A, impacts to power production and energy use in the Extended Study Area for Alternative B would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative**.**

Table 31-9
CVP, SWP, and Proposed Project Facilities Energy Use (in GWh)[a] – Alternative B

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	Alternative B	Alternative B minus Existing Conditions	Alternative B minus No Project/No Action Alternative
CVP Facilities						
Energy Generation	Long-Term[b]	4,712	4,701	4,718	6	18
	Dry and Critical[c]	3,533	3,513	3,506	-27	-6
Energy Use	Long-Term	1,124	1,116	1,147	23	32
	Dry and Critical	894	878	902	8	25
Net Generation[d]	Long-Term	3,588	3,585	3,571	-17	-14
	Dry and Critical	2,639	2,635	2,604	-35	-31
SWP Facilities						
Energy Generation	Long-Term	4,326	4,386	4,493	167	107
	Dry and Critical	3,033	2,909	3,128	96	220
Energy Use	Long-Term	7,848	8,088	8,464	616	376
	Dry and Critical	6,354	6,013	6,727	373	714
Net Generation	Long-Term	-3,522	-3,702	-3,971	-449	-269
	Dry and Critical	-3,321	-3,104	-3,599	-277	-494
Proposed Project Facilities[d]						
Energy Generation	Long-Term	0	0	104	104	104
	Dry and Critical	0	0	100	100	100
Energy Use	Long-Term	13	13	195	183	182
	Dry and Critical	11	12	106	95	95
Net Generation	Long-Term	-13	-13	-91	-79	-78
	Dry and Critical	-11	-12	-6	5	6
All Facilities (CVP, SWP and Proposed Project)[e]						
Energy Generation	Long-Term	9,038	9,087	9,316	277	229
	Dry and Critical	6,566	6,422	6,735	170	313
Energy Use	Long-Term	8,983	9,214	9,801	818	587
	Dry and Critical	7,257	6,901	7,732	474	830
Net Generation	Long-Term	51	-132	-498	-548	-366
	Dry and Critical	-694	-482	-1,004	-310	-522

[a]Results are estimated using LTGEN, SWP_Power, and NODOS_Power using data from the CALSIM II model.
[b]Long-Term is the average quantity for the calendar years 1922-2002.
[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.
[d]Proposed Project Facilities include Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities.
[e]Energy Use and Net Generation for all facilities does not equal sum of Energy Use and Net Generation for CVP, SWP, and Project facilities because energy use at Red Bluff Pumping Plant (RBPP) is included in both CVP and Project facilities. Results for RBPP from LTGEN are subtracted from Energy Use and Net Generation for all facilities to avoid double-counting.

Notes:

CVP = Central Valley Project
GWh = gigawatt-hours
SWP = State Water Project

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Alternative B would not likely decrease per capita energy consumption in the Extended Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Therefore, Alternative B is expected to promote the use of renewable energy, and would not cause a reduction in generation of renewable energy. Therefore, operation of Alternative B would result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.8.2 Secondary Study Area – Alternative B

Construction, Operation, Maintenance, and Recreation Use Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative B as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Secondary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Impacts on power production and energy use associated with Alternative B would be less than that for Alternative A. Alternative B would have approximately the same effect on overall energy generation and consumption as Existing Conditions and the No Project/No Action Alternative, but would offer the benefit of additional renewable generation, and services to better integrate other sources of renewable energy into the grid. Impacts to power production and energy use in the Secondary Study Area for Alternative B would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Similar to Alternative A, Alternative B would not likely decrease per capita energy consumption in the Secondary Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Operation of Alternative B would, therefore, result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.8.3 Primary Study Area – Alternative B

Construction, Operation, Maintenance, and Recreation Use Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative B as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Primary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Alternative B would include a larger Sites Reservoir than Alternative A, allowing an increase in Sites Pumping/Generating Plant capacity to 121 MW, but also an increase in pumping demand of 181.35 MW. Power generation at the TRR, and pumping mode at the Sites and TRR pumping/generating plants, would be the same as described for Alternative A, but the Delevan Pipeline Discharge Facility would be a release-only facility with no pumping or power generation capabilities. Adverse effects on power production and energy use in the Primary Study Area for Alternative B would be reduced, when compared to Alternative A because Alternative B would have more ability to integrate renewable energy into the grid, and benefits would be greater than Alternative A due it its potential to offset fossil fuel generation during times of peak demand. Alternative B would have approximately the same effect on overall energy generation and consumption as Existing Conditions and the No Project/No Action Alternative, but would offer the benefit of additional renewable generation, and services to better integrate other sources of renewable energy into the grid. Therefore, with effective planning efforts for transmission system and power generation capacity additions accounting for the future effects of Project operations, impacts to power or energy use from implementation of Alternative B, when compared to Existing Conditions and the No Project/No Action Alternative would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Alternative B would not likely decrease per capita energy consumption in the Primary Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Operation of Alternative B would, therefore, result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.9 Impacts Associated with Alternative C

31.3.9.1 Extended Study Area – Alternative C

<u>Construction, Operation, Maintenance, and Recreation Use Impacts</u>

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative C as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Extended Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

When compared to Existing Conditions, Alternative C would result in a net increase in maximum demand of approximately 276 MW for Project pumping power, and a net increase in maximum generating capacity of 141.6 MW. When compared to the No Project/No Action Alternative, the net change in demand and generation in the Extended Study Area caused by development of Alternative C would likely be approximately the same, based on normal load growth and the processes in place to ensure sufficient water supply and electric power generation and transmission capacity remain in place to meet reliability standards.

From a power production and energy use perspective, Alternative C would increase electricity demand by approximately 23 MW when compared to Alternative A (an 8.5 percent increase), and would increase generating capacity by approximately 10 MW when compared to Alternative B (an 8 percent increase). Alternative C would, therefore, offer comparable potential for adverse impact on power demand and energy use when compared to Alternative A. It would also offer the same level of benefit to the system due it its similar generating capacity. Maximum electricity demand for Alternative C pumping would equal approximately 0.19 percent of the total 2009 electric demand in the western U.S. and Canada (compared to 0.17 percent for Alternative A), and would reduce the generation reserve margin by that amount during maximum pumping operations. Alternative C pumping load would be approximately 0.16 percent of total load in the region in 2019 (identical to Alternative A). When operated at maximum generating capacity, Alternative C would add approximately 0.07 percent to the 2009 generation reserve; it would add approximately 0.06 percent in 2014, and 0.06 percent in 2019 (all identical to Alternative A).

As shown in Table 31-10, modeling showed that the addition of Alternative C to the CVP and SWP would cause a net increase in energy use of 594 GWh by CVP and SWP facilities, when compared to Existing Conditions, and a net increase in energy use of 411 GWh by CVP and SWP facilities, when compared to the No Project/No Action Alternative. Table 31-10 does not show the increase in ancillary service production, which would serve to increase system reliability. When compared to 2009 total electrical energy use of 858,793 GWh in the Extended Study Area (Western Interconnection), and projected 2019 energy use of more than 1 million GWh, the increased energy use that would result from Alternative C in 2025 would be 0.05 and 0.04 percent, respectively, of the 2009 actual energy use and 2019 projected electrical energy use in the Extended Study Area (identical to Alternative A). Project-related energy use associated with Alternative C is not expected to be inefficient, wasteful, or unnecessary because it would be used to store water and potential electric energy for later use when needed and would therefore result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 31-10
CVP,SWP, and Proposed Project Facilities Energy Use (in GWh)[a] – Alternative C

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	Alternative C	Alternative C minus Existing Conditions	Alternative C minus No Project/No Action Alternative
CVP Facilities						
Energy Generation	Long-Term[b]	4,712	4,701	4,715	3	14
	Dry and Critical[c]	3,533	3,513	3,479	-54	-34
Energy Use	Long-Term	1,124	1,116	1,155	31	40
	Dry and Critical	894	878	901	8	24
Net Generation[d]	Long-Term	3,588	3,585	3,559	-28	-26
	Dry and Critical	2,639	2,635	2,578	-62	-58

Table 31-10
CVP, SWP, and Proposed Project Facilities Energy Use (in GWh)[a] – Alternative C

Parameter	Long-Term Average or Dry and Critical Water Year Type Average	Existing Conditions	No Project/No Action Alternative	Alternative C	Alternative C minus Existing Conditions	Alternative C minus No Project/No Action Alternative
SWP Facilities						
Energy Generation	Long-Term	4,326	4,386	4,496	170	110
	Dry and Critical	3,033	2,909	3,168	136	259
Energy Use	Long-Term	7,848	8,088	8,473	625	385
	Dry and Critical	6,354	6,013	6,848	494	834
Net Generation	Long-Term	-3,522	-3,702	-3,977	-455	-275
	Dry and Critical	-3,321	-3,104	-3,679	-358	-575
Proposed Project Facilities[d]						
Energy Generation	Long-Term	0	0	157	157	0
	Dry and Critical	0	0	173	173	0
Energy Use	Long-Term	13	13	278	265	13
	Dry and Critical	11	12	199	188	11
Net Generation	Long-Term	-13	-13	-121	-108	-13
	Dry and Critical	-11	-12	-26	-15	-11
All Facilities (CVP, SWP and Proposed Project)[e]						
Energy Generation	Long-Term	9,038	9,087	9,368	329	281
	Dry and Critical	6,566	6,422	6,821	255	399
Energy Use	Long-Term	8,983	9,214	9,901	918	687
	Dry and Critical	7,257	6,901	7,945	687	1,044
Net Generation	Long-Term	51	-132	-543	-594	-411
	Dry and Critical	-694	-482	-1,131	-437	-649

[a]Results are estimated using LTGEN, SWP_Power, and NODOS_Power using data from the CALSIM II model.

[b]Long-Term is the average quantity for the calendar years 1922-2002.

[c]Dry and Critical is the average quantity for Dry and Critical years according to the Sacramento River 40-30-30 index.

[d]Proposed Project Facilities include Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal pumping facilities.

[e]Energy Use and Net Generation for all facilities does not equal sum of Energy Use and Net Generation for CVP, SWP, and Project facilities because energy use at Red Bluff Pumping Plant (RBPP) is included in both CVP and Project facilities. Results for RBPP from LTGEN are subtracted from Energy Use and Net Generation for all facilities to avoid double-counting.

Notes:

CVP = Central Valley Project
GWh = gigawatt-hours
SWP = State Water Project

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Similar to Alternative A, Alternative C would not likely decrease per capita energy consumption in the Extended Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. The increased energy use resulting from the additional water storage available from Alternative C to CVP or SWP customers, when compared to Existing Conditions and the No Project/No Action Alternative, would displace energy use associated with other water sources, perhaps leading to a net reduction in water-related energy use in the Extended Study Area. Operation of Alternative C is, therefore, expected to result in a **less-than-significant impact** to power and energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.9.2 Secondary Study Area – Alternative C

Construction, Operation, Maintenance, and Recreation Use Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative C as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Secondary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

Maximum electric demand for pumping if Alternative C is implemented would equal approximately 0.47 percent of the total 2009 electric demand in California, and would reduce the generation reserve margin by that amount in the state during maximum pumping operations. Alternative C pumping demand would be approximately 0.45 percent of total demand in 2014 in the Secondary Study Area, and 0.43 percent of total demand in 2019, compared to 0.41 percent and 0.36 percent, respectively, for Alternative A. When operated at maximum generating capacity, Alternative C would add approximately 0.19 percent to the 2009 generation reserve in the same region, compared to 0.17 percent for Alternative A. The modeling projection of a 411 GWh increase in energy use by CVP and SWP facilities, when compared to the No Project/No Action Alternative, would be 0.29 percent of the 2009 total electrical energy use of 124,405 GWh, and 0.26 percent of the 2019 energy use of 140,378 GWh, in the Primary Study Area (northern California). This increased energy use caused by Alternative C in 2025 would be 0.14 percent of the 2009 total Secondary Study Area electrical energy use of 285,913 GWh, and 0.13 percent of the projected 2019 energy use of 321,649 GWh.

By making up to 1.81 MAF of additional storage available for the water system, water releases from Alternative C would lead to increased use of energy for pumping the released water as far as Southern California. Energy use associated with Alternative C would not be inefficient, wasteful, or unnecessary because it would be used to store water and potential electric energy for later use when needed. Impacts to power and energy caused by operation of Alternative C would, therefore, be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Similar to Alternative A, Alternative C would not likely decrease per capita energy consumption in the Secondary Study Area, but would promote increased reliance on renewable resources and decreased reliance on fossil fuels due to its ability to assist integration of variable renewable power resources, such as wind and solar. Operation of Alternative C would, therefore, result in a **less-than-significant impact** to power or energy use, when compared to Existing Conditions and the No Project/No Action Alternative.

31.3.9.3 Primary Study Area – Alternative C

Construction, Maintenance, and Recreation Use Impacts

Impact Power-1: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Construction, Maintenance, and Recreation Activities

The impacts associated with Alternative C as they relate to inefficient, wasteful, or unnecessary consumption of energy during construction, maintenance, and recreation activities would be the same as described for Alternative A for the Primary Study Area.

Impact Power-2: Inefficient, Wasteful, or Unnecessary Consumption of Energy during Operational Activities

For Alternative C, the Sites Pumping/Generating Plant would use up to 181.4 MW in pumping mode, and would generate up to 121 MW; the TRR Pumping/Generating Plant would use up to 19.68 MW in pumping mode, and generate up to 9.8 MW; and the Delevan Pipeline Intake Facilities would use up to 65.5 MW in pumping mode, and generate up to 10.8 MW. Maximum electricity demand for Alternative C (276 MW) would equal approximately 1.1 percent of the total 2009 electric demand in northern California, and would reduce the generation reserve margin by that amount in the State during maximum pumping operations. Alternative C pumping demand would be approximately 1.04 percent of total 2014 demand in the region, and 1.0 percent of total 2019 demand. When operated at maximum generating capacity, Alternative C would add approximately 0.46 percent to the 2009 generation reserve; it would add a projected 0.36 percent of total northern California generation capacity in 2014, and 0.37 percent in 2019. The modeling projection of a 265 GWh increase in energy use by CVP and SWP facilities, when compared to Existing Conditions and the No Project/No Action Alternative, would be 0.21 percent of the 2009 total electrical energy use of 124,405 GWh, and 0.19 percent of the 2019 energy use of 140,378 GWh, in the Primary Study Area (northern California). The overall effect on power and energy use by Alternative C is, therefore, nearly identical to that of Alternative A, including beneficial effects. Project-related energy use associated with Alternative C is not expected to be inefficient, wasteful, or unnecessary because it would be used to store water and potential electric energy for later use when needed and would therefore result in a **less-than-significant impact**, when compared to Existing Conditions and the No Project/No Action Alternative.

Impact Power-3: A Substantial Reduction in the Generation of Renewable Energy

Similar to Alternative A, this net increase in demand would likely be accommodated by proper power planning studies, especially given the projected large generation margins in the region.

Alternative C operations could increase the reliability of the grid both by curtailing power use for pumping (up to 276 MW in essentially instantaneous reduction for Alternative C), and by ramping up power production (up to 141.6 MW). This ability will also assist in integrating renewable energy generation into the grid as utilities increase purchases of renewable energy to meet RPS requirements. Alternative C water operations also could provide at least a partial offset of pumping energy use if the water released from Alternative C storage displaces a more intensive water source, such as deep groundwater or desalination. Impacts to power and energy use from Alternative C would be **less than significant**, when compared to Existing Conditions and the No Project/No Action Alternative.

31.4 Mitigation Measures

With continued effective planning for California transmission grid improvements and generation capacity additions, impacts to power production and energy use associated with operation of the Project would be **less than significant.** Therefore, no mitigation is required or recommended.

31.5 References

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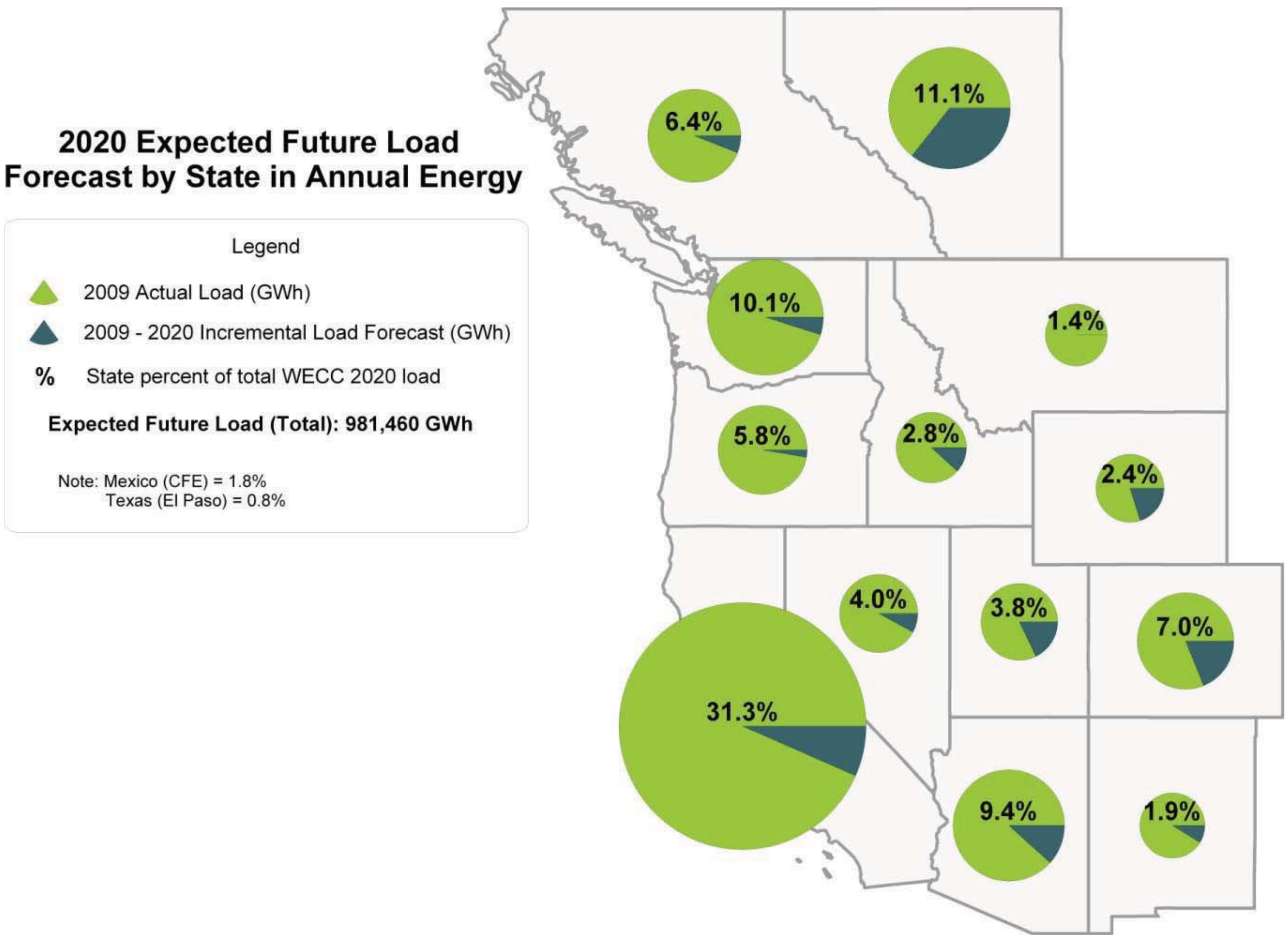
Figures



Source: WECC

FIGURE 31-1
Western Electric Coordinating Council, Loads by State and Province
North-of-the Delta Offstream Storage Project

WBG020812033556SAC

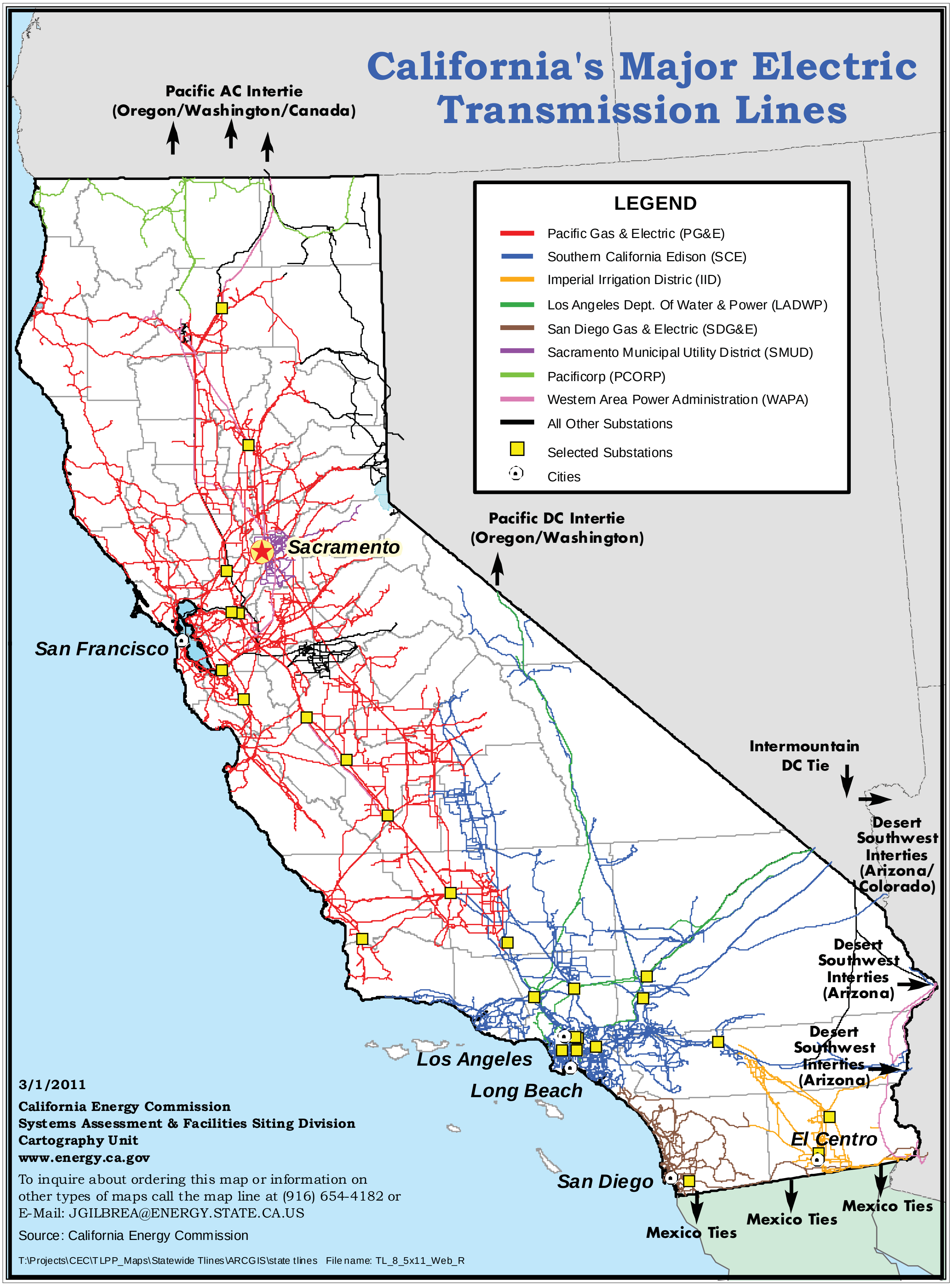


FIGURE 31-2
California Electric Transmission System
North-of-the Delta Offstream Storage Project

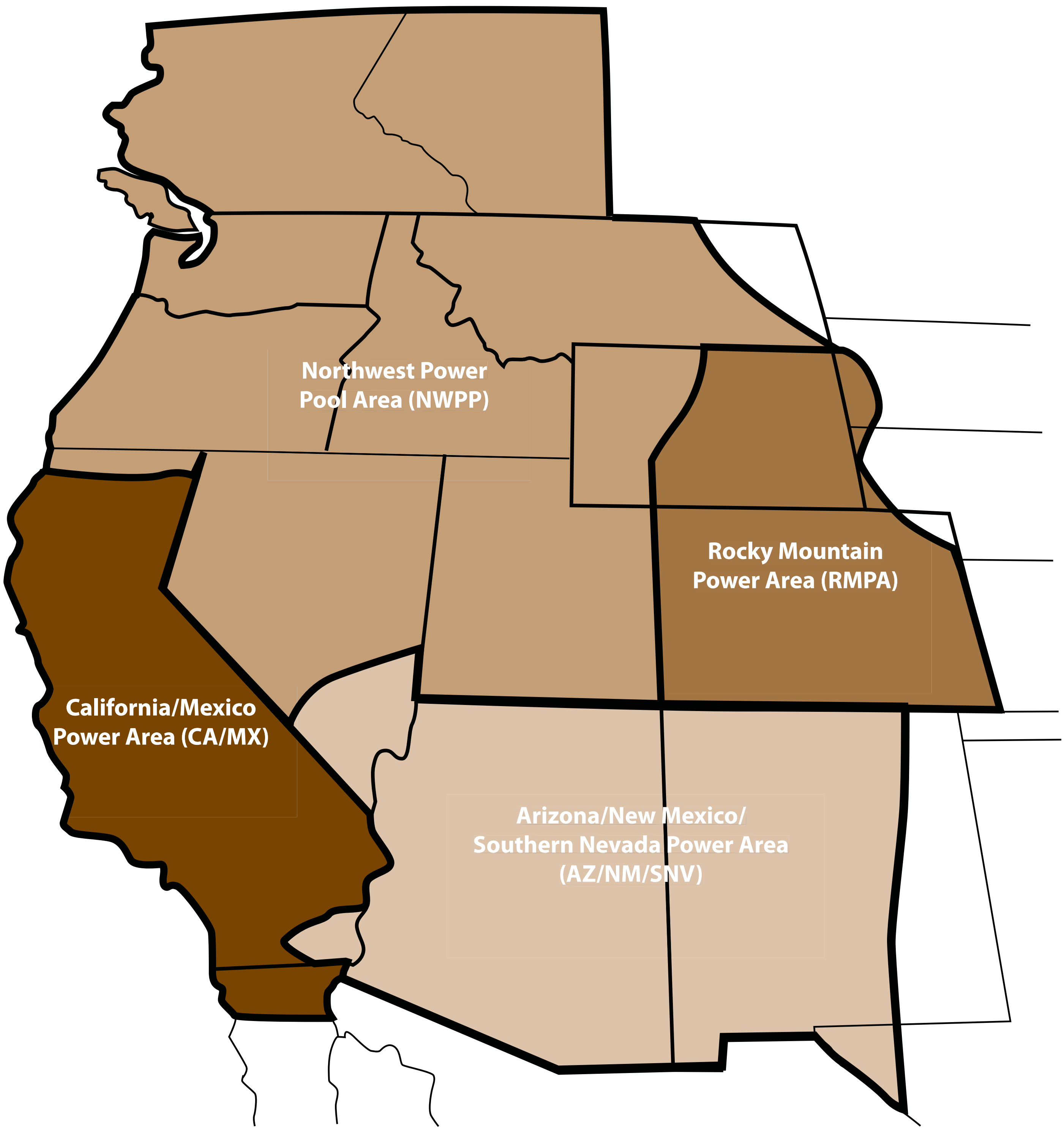
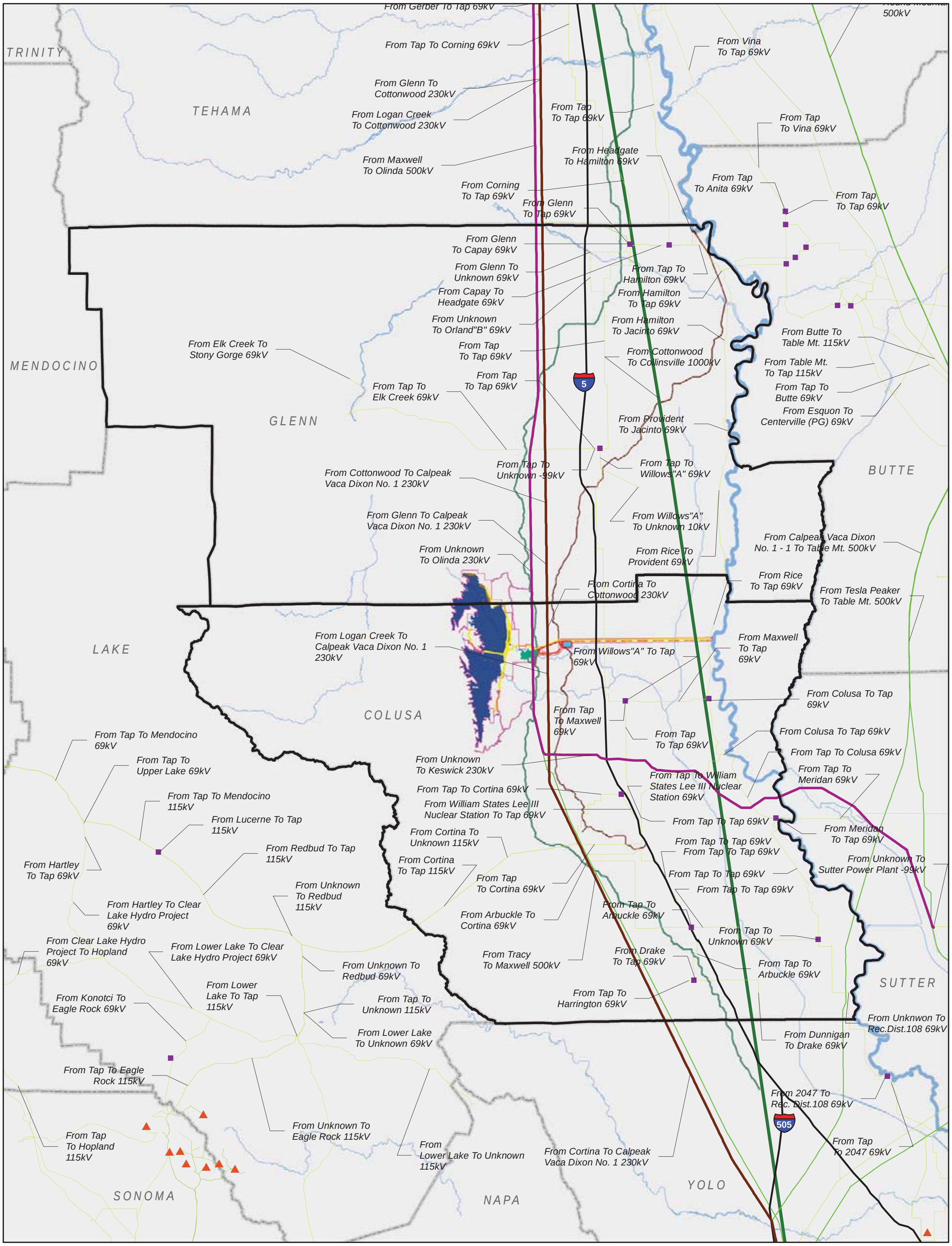


FIGURE 31-3
WECC Reporting Areas
North-of-the Delta Offstream Storage Project

This document is not released as a draft EIR pursuant to CEQA Guidelines § 15087. As such, DWR is not soliciting and will not respond to comments submitted on this document, although any comments received will be retained and may be considered during preparation of a future draft EIR.



Legend

- Glenn and Colusa Counties
- Substation
- PGE Co. (230-kV)
- WAPA (500-kV)
- Power Generating Facility

Transmission Lines

- Below 230kV
- 230kV - 344kV
- 345kV - 499kV
- 500kV - 734kV
- 735kV - 999kV
- AC-DC-AC Tie
- DC

Project Facilities

- GCID Pumping/Generating Plant
- Construction Disturbance Area
- Delevan Transmission Line
- Delevan & TRR Pipelines
- Delevan Pipeline Discharge
- Delevan Pipeline Intake/Outlet
- Holthouse Dam
- Dams
- GCID Canal
- T-C Canal
- TRR Pumping/Generating Plant
- TRR
- Funks/Holthouse Reservoir
- Sites Reservoir
- Sacramento River
- Rivers and Streams

SOURCE: Existing Transmission Line Data, Platts Data 2010.

0 3 6 9 12 15 Miles

N

FIGURE 31-4
Transmission Lines in Glenn and Colusa Counties Relative to Project Facilities
North-of-the-Delta Offstream Storage Project

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32. Relationship Between Short-Term Uses and Long-Term Productivity

32.1 Introduction

The Council on Environmental Quality (CEQ) NEPA regulations (40 CFR 1502.16) require consideration of "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity". This consideration involves using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which humans and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans. This section of the NEPA regulations recognizes that short-term uses and long-term productivity of the environment are linked, and that opportunities that are acted upon have consequences that could have continuing effects well into the future.

In addition, California Public Resources Code §21001(g) indicates that it is the policy of the State to "require governmental agencies at all levels to consider qualitative factors as well as economic and technical factors and long-term benefits and costs, in addition to short-term benefits and costs…"

The Project's three action alternatives (Alternatives A, B, and C) analyzed in this EIR/EIS would involve construction of new facilities, including a reservoir, dams, recreation areas, roads, a bridge, pumping/generating plants, electrical switchyards, an inlet/outlet structure and tunnel, a spillway and stilling basin, pipelines, a canal connection, a transmission line, and pipeline intake/discharge facilities. Alternatives A, B, and C also include improvements to existing facilities, such as installation of a new pump at an existing pumping plant, road relocations, dredging and expanding an existing reservoir, and modifications to an existing canal and its facilities. In addition, the three alternatives include the demolition of 108 structures[1], the removal of several existing paved and gravel roads, and the inundation of lands to create a reservoir. The specific impacts of the Project alternatives would vary in type, intensity, and duration according to the activities occurring at any given time. Implementation of the NODOS Project would require tradeoffs between long-term productivity and short-term uses of the environment.

32.2 Short-Term and Long-Term Effects of the Alternatives

The expected impacts on environmental resources as a result of constructing, operating, and maintaining Alternatives A, B, and C were presented in Chapters 6 through 31. The conclusions presented in those chapters were the basis for developing Table 32-1; the table summarizes the short-term[2] and long-term[3] effects of implementing the three alternatives.

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[1] This includes 26 residences, 31 barns, 27 sheds, 4 shops, and 20 other peripheral structures.

[2] For the purposes of this chapter, a short-term effect would occur during Project construction and could last from the time construction ceases to within three to five years after Project construction. A temporary effect would last less than three to four years and typically would occur only during Project construction. As such, temporary effects are included in Table 32-1 in the Short-Term Effects columns.

[3] For the purposes of this chapter, a long-term effect would last longer than five years after the completion of Project construction. In some cases, a long-term effect could be a permanent effect.

To provide a balanced discussion for each environmental resource, Table 32-1 lists the "potentially significant" or "significant" short-term effects (both beneficial and adverse) and the long-term "potentially beneficial" and "beneficial" and "significant unavoidable" adverse effects associated with each environmental resource.

In this chapter, "short-term effects" relate to the "short-term uses of environmental resources", and "long-term effects" relate to the "maintenance and enhancement of long-term productivity" – in particular, the consistency of the Proposed Project/Proposed Action with long-term economic, social, regional, and local planning objectives.

It should be noted that the relationship between short-term uses and long-term productivity of the Proposed Project/Proposed Action would not be appreciably different between Alternatives A, B, and C, but instead, the effects would result from the implementation of the Proposed Project/Proposed Action itself.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
Surface Water Resources	None	None	When compared to Existing Conditions, over the long-term averages, the total annual average CVP deliveries for all hydrologic regions show increases would occur for the three alternatives. Over the long-term averages, Wildlife Refuge Level 2 deliveries would increase in the Sacramento River Hydrologic Region, and would decrease in the San Joaquin River and Tulare Lake hydrologic regions. Over the long-term averages, Wildlife Refuge Level 4 supplies for Alternatives A, B, and C would increase in the Sacramento River, San Joaquin River, and Tulare Lake hydrologic regions.	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
			When compared to Existing Conditions, over the Dry and Critical water years averages, the total annual average CVP deliveries for all hydrologic regions show increases would occur for the three alternatives. Over the Dry and Critical water years averages, annual Wildlife Refuge Level 2 deliveries would increase in the Sacramento River Hydrologic Region, and would decrease in the San Joaquin River and Tulare Lake hydrologic regions. Over the Dry and Critical water years averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would increase in the Sacramento River, San Joaquin River, and Tulare Lake hydrologic regions.	None
			When compared to the No Project/No Action Alternative, over the long-term averages, the total annual CVP deliveries for all hydrologic regions show that increases would occur for the three alternatives. Over the long-term averages, Wildlife Refuge Level 2 deliveries would increase in only the Sacramento River Hydrologic Region for the three alternatives. Over the long-term averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would be the same, when compared to the No Project/No Action Alternative.	None
			When compared to the No Project/No Action Alternative, over the Dry and Critical water years averages, the total annual CVP deliveries for all hydrologic regions show increases would occur for the three alternatives. Over the Dry and Critical water years averages, annual Wildlife Refuge Level 2 deliveries would increase in only the Sacramento River Hydrologic Region. Over the Dry and Critical water years averages, Wildlife Refuge Level 4 supplies for the Alternatives A, B, and C would be the same.	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
			When compared to Existing Conditions, over the long-term averages, total annual SWP deliveries to all hydrologic regions show an increase would occur for the three alternatives.	None
			When compared to Existing Conditions, over the Dry and Critical water years averages, total SWP deliveries for all hydrologic regions show an increase would occur for the three alternatives.	None
			When compared to the No Project/No Action Alternative, over the long-term averages, total annual SWP deliveries for all hydrologic regions show an increase would occur for the three alternatives.	None
			When compared to the No Project/ No Action Alternative, over the Dry and Critical water years averages, the total annual SWP deliveries to all hydrologic regions show an increase would occur for the three alternatives.	None
Surface Water Quality	None	None	None	None
Fluvial Geomorphology and Riparian Habitat	None	None	Suspended sediment that could deposit in spawning gravel, agricultural fields, navigable water, and in weirs and bypasses would be reduced in the Secondary Study Area.	None
			A slight increase in bank erosion and meander rates would occur in the Secondary Study Area, resulting in more benefits to riparian vegetation, fish, and wildlife because of a slight increase in floodplain rejuvenation.	None
			Flow would be reduced downstream of the intakes in the Sacramento River, which would reduce the mobility of the bedload in the channel. This may have a slight aggradational effect to the channel downstream of each intake because bedload derived from bank erosion and tributaries would continue to move into the area. This would be beneficial to salmon spawning gravel riffle habitat.	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
Flood Control and Management	None	None	The magnitude of peak flow on Funks and Stone Corral creeks would decrease downstream of the dams.	None
Groundwater Resources	None	None	None	None
Groundwater Quality	None	None	The increase in surface water supply reliability in the Extended Study Area could reduce groundwater extraction rates, allowing groundwater recharge to improve groundwater quality.	None
			Surface water seepage and percolation from the Sites Reservoir, Holthouse Reservoir, Terminal Regulating Reservoir, and the forebay at Delevan Pipeline Intake Facilities could benefit shallow groundwater quality.	None
Aquatic Biological Resources	None	None	Beneficial effects would occur to coldwater fish species and warmwater fish species.	None
			Beneficial effects would occur to winter-run and spring-run Chinook salmon in the Sacramento River.	None
			Beneficial effects would occur to Pacific lamprey and river lamprey in the American River.	None
			Beneficial effects would occur to striped bass and American shad in the American River.	None
			The establishment of the Ecosystem Enhancement Fund as an endowment to provide long-term funding for aquatic habitat restoration actions on the Sacramento River and its tributaries would result in beneficial effects to anadromous salmonids and sturgeon.	None
Botanical Resources	None	None	None	Impact on a vegetation community would occur from Holthouse Reservoir Complex.
	None	None	None	Impact on an alkaline wetland would occur from Holthouse Reservoir Complex.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
	None	None	None	Impact on CNPS List 1B and State- or Federally listed plant species would occur at Sites Reservoir and Dams.
	None	None	None	Impact on CNPS List 4 plant species at Sites Reservoir and Dams.
	None	None	None	Impact on special-status plant species would occur from Holthouse Reservoir Complex.
Terrestrial Biological Resources	None	Loss of golden eagle territories and potential loss of nests would occur from Sites Reservoir and Dams and Recreation Areas	Beneficial effects on wildlife habitat and special-status wildlife species would occur from improved storage conditions and reduced water level fluctuations at Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. A potentially beneficial effect on many avian species, including the bald eagle, would result from the filling of Sites Reservoir by creating lacustrine habitat.	Loss of golden eagle territories and potential loss of nests from Sites Reservoir and Dams and Recreation Areas.
Wetlands and Waters of the U.S.	None	None	None	None
Geology, Minerals, Soils, and Paleontology	None	None	None	None
Faults and Seismicity	None	None	None	None
Cultural Resources	None	None	None	Substantial adverse change in the significance of a historical resource of the built environment as defined in §15064.5 from several Project facilities, if they are eligible for CRHR or NRHP listing.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

	Short-Term Effects*		Long-Term Effects*	
Resource	**Beneficial**	**Adverse**	**Beneficial**	**Adverse**
			None	Impacts to some categories of Traditional Cultural Properties would occur from disturbance during Project construction, operation, and maintenance.
Indian Trust Assets	None	None	None	None
Land Use	None	The inundation of Antelope Valley would eliminate the town of Sites	None	The inundation of Antelope Valley would eliminate the town of Sites.
		Convert Prime Farmland and Unique Farmland at certain Project facility locations to non-agricultural use	None	Convert Prime Farmland and Unique Farmland at certain Project facility locations to non-agricultural use.
		Conflict with existing Agricultural Preserve zoning in Colusa County and land zoned Foothill Agricultural/ Forestry Zone in Glenn County to non-agricultural use	None	Conflict with existing Agricultural Preserve zoning in Colusa County and land zoned Foothill Agricultural/ Forestry Zone in Glenn County to a non-agricultural use.
		Conflict with Williamson Act contracts for parcels where several Project facilities would be located	None	Conflict with Williamson Act contracts for parcels where several Project facilities would be located.
Recreation Resources	None	None	Available recreational opportunities and recreational days would increase at San Luis Reservoir, Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.	None
Socioeconomics	None	None	None	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	**Adverse**	**Beneficial**	**Adverse**
Environmental Justice	Increase employment opportunities for minorities whom have the appropriate construction, operation, or maintenance skillset for the Project	None	Increase employment opportunities for minorities whom have the appropriate construction, operation, or maintenance skillset for the Project.	None
			Increase recreational opportunities in Glenn and Colusa counties for minority and low-income populations.	None
Air Quality	None	Generate emissions during Project construction of PM_{10}, NO_x, and ROG that could conflict with an applicable Air Quality Plan, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of nonattainment pollutants	None	None
Climate Change and Greenhouse Gas Emissions	None	None	None	GHG emissions would result during the nine-year Project construction period.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
			Operation of the proposed Project facilities (without consideration of pumpback operations) would require additional energy beyond what would be generated. However, the way the facilities would be operated and integrated into the California electricity market would actually result in annual reductions in GHG emissions. Maintenance of proposed Project facilities would generate emissions. Because increases in GHG emissions associated with construction of the proposed Project would be more than offset by reductions in GHG emissions from operation, there would be no long-term increase over the net-zero threshold. Over the life of the proposed Project, Alternative A would be likely to substantially reduce GHG emissions.	None
			Proposed Project operation would result in a net increase in the amount of energy needed annually to operate the SWP. However, given the scale of additional emissions that the proposed Project would add to DWR's total GHG emissions, no additional actions or commitments would be required. The proposed Project would not adversely affect DWR's ability to achieve the GHG emissions reduction goals set forth in the GGERP and would not conflict with any of the specific action GHG emissions reduction measures set forth in the GGERP.	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	**Adverse**	**Beneficial**	**Adverse**
			None	Implementation of the proposed Project would result in an increase in CVP electricity use. This additional demand would be served by energy generated at CVP hydroelectric facilities that emit no GHGs, and therefore, would result in no GHG emissions. However, the small increase in electricity usage to operate the CVP with the proposed Project would result in a corresponding reduction in the supply of GHG-emissions-free electricity available to sell to California electricity users. This reduction in hydroelectric energy available for sale could result in a potential indirect effect of the proposed Project. These emissions could contribute to a cumulatively considerable effect, when compared to Existing Conditions and the No Project/No Action Alternative.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
			None	Research indicates that the surfaces of some reservoirs may be emitting or absorbing GHGs. Based on these studies of emissions from open water systems and considering the zero emissions factor typically assigned to hydroelectric power generation, emissions associated with the proposed Project's open water surfaces and tailraces would likely be a less-than-significant impact, when compared to Existing Conditions and the No Project/No Action Alternative.
Navigation, Transportation, and Traffic	None	None	None	None
Noise	None	None	None	None
Public Health and Environmental Hazards	None	None	None	None
Public Services and Utilities	None	None	Project operation would possibly reduce reliance on groundwater in the Extended Study Area in locations where water is provided by the CVP or SWP; with increased water supply reliability to CVP and SWP water contractors, shortages in deliveries may decrease.	None

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	Adverse	Beneficial	Adverse
	None	None	Increased water supply reliability could potentially result in a reduction in the future need for construction and operation of additional water treatment and distribution facilities by shifting from more costly options (including high cost recycling and desalination) to the less expensive option of maintaining and operating the existing water treatment and conveyance systems that are already in use.	None
Visual Resources	None	None	A potential beneficial effect to overall visual resources within the wildlife refuges in the Extended Study Area would result because a stable water supply would support existing wetland habitat.	None
	None	None	A potential beneficial effect to visual resources within the Secondary Study Area from increased storage within the reservoirs that would result in a general increase and stabilization in flows within rivers and creeks within the Secondary Study Area.	None
	None	None	Increased flows throughout the Sacramento River region.	None
	None	None	A beneficial effect to visual resources from the operation and maintenance of the proposed Recreation Areas, which would offer new recreation opportunities in scenic lakeside and island settings consistent with the Colusa County General Plan, and create viewing opportunities during Above Normal and Wet years that do not currently exist.	None
	None	None	None	The South Bridge and the Terminal Regulating Reservoir would result in adverse effects to a scenic vista.

Table 32-1
Short-Term and Long-Term Effects of Alternatives A, B, and C by Environmental Resource

Resource	Short-Term Effects*		Long-Term Effects*	
	Beneficial	**Adverse**	**Beneficial**	**Adverse**
	None	None	None	Sites Reservoir Inundation Area, the Road Relocations and South Bridge, and Terminal Regulating Reservoir would result in effects to the existing visual character or quality of the site and its surroundings.
	None	None	None	The Sites Reservoir Inundation Area would introduce a new source of light or glare that would adversely affect day or nighttime views in the area.
Power Production and Energy	None	None	None	None

*This table lists the "potentially significant" or "significant" short-term effects (both beneficial and adverse) associated with each environmental resource, and the long-term "potentially beneficial", "beneficial", and "significant unavoidable" effects (i.e., impacts that would remain significant after the implementation of mitigation measures).

32.3 Conclusion

In conclusion, the long-term benefits of the improved operational flexibility of the State's water system, as a result of implementing the Project (any of the three action alternatives, A, B, or C) would outweigh the short-term and long-term adverse effects on the individual resources evaluated in this EIR/EIS.

33. Irreversible or Irretrievable Resource Commitments

33.1 Introduction

The California Environmental Quality Act (CEQA) *Guidelines* requires a discussion of the significant irreversible environmental changes that would be caused by the proposed Project if it is implemented. *CEQA Guidelines* §15126.2(c) states that "Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified" (AEP, 2011).

The National Environmental Policy Act (NEPA) (Section 101(2)(c)(v) and 40 CFR 1502.16) requires that the environmental analysis identify "any irreversible and irretrievable commitment of resources which would be involved in the proposed action should it be implemented." The Act, Council on Environmental Quality (CEQ) NEPA regulations, and NEPA guidance, however, do not define "resources" or describe how this requirement should be applied.

The U. S. Bureau of Reclamation (Reclamation) and other federal agencies have interpreted irreversible and irretrievable commitments to mean the use of nonrenewable resources and the effects this use would have in the future. Reclamation defines the irreversible commitment of resources to be the result of the use or destruction of a specific resource (e.g., minerals extraction or the destruction of cultural resources) that cannot be replaced or, at a minimum, restored over a long period of time and possibly at great expense. Reclamation also defines the irretrievable commitment of resources to the loss of production or use of natural resources, indicating that it represents opportunities that are foregone for the period of time that a resource cannot be used (e.g., land conversion to new uses or the construction of levees preventing the natural flooding of floodplains). Reclamation also indicates that the analysis shall, for each alternative, identify those commitments of resources that are irreversible and irretrievable (Reclamation, 2012).

The following discussions identify those commitments of resources that are irreversible and irretrievable, as well as the uses in which irreversible damage could result from a potential environmental accident associated with any of the proposed Project's three action alternatives.

33.2 Commitments of Resources by the Proposed Project's Action Alternatives

The commitment of resources would be similar for all of the proposed Project's action alternatives. Therefore, the following discussions of the proposed Project's commitments of resources apply to Alternatives A, B, and C. The proposed Project would result in the irreversible and irretrievable commitment of the following resources during Project construction, operation, and maintenance:

- Construction materials, including such resources as wood, rocks, soil, and metal

- Energy expended in the form of electricity, gasoline, diesel fuel, oil, and lubricants for construction equipment and vehicles, and construction worker vehicles that would be needed for Project construction, operation, and maintenance
- Construction labor
- Permanent changes in land use, including the conversion of prime agricultural land to other uses, at Project facility locations due to land that would be committed to new and modified Project facilities and land areas inundated with water
- Changes in the visual resources and landscape character of lands where Project facilities would be located
- Effects on biological and cultural resources located at Project facility locations

Some of the materials that would be used for the proposed Project are nonrenewable resources and are considered irretrievably and irreversibly committed because reuse is not possible or is highly unlikely. Nonrenewable resources are expected to account for a minimal portion of the region's resources; any of the proposed Project's action alternative's use of nonrenewable resources would not affect the availability of these resources for other needs within the region. These resources are discussed in further detail below.

33.2.1 Construction Materials

Construction of the proposed Project facilities would result in the use of construction materials, including wood, cement, sand, gravel, other rock and earthen materials, and metal materials, all considered to be non-renewable or slowly renewable resources. These materials would be irretrievably committed toward the construction of the proposed Project facilities. Most of these materials would be obtained from within the proposed Sites Reservoir Inundation Area, and some materials would be imported to the proposed Project facility sites from nearby commercial sources.

33.2.2 Energy Consumption

Construction of the proposed Project facilities would result in the consumption of energy (considered a commitment of nonrenewable energy resources), primarily in the form of fossil fuels including fuel oil, natural gas, and gasoline for automobiles and construction equipment. In addition, nonrenewable energy resources would be required to manufacture and transport many of the Project equipment components that would be assembled at the proposed Project facility sites. Project construction activities are not expected to result in the inefficient use of energy because DWR and Reclamation would require that Project construction contractors use best available engineering techniques, construction and design practices, and equipment operating procedures during construction of the proposed Project facilities.

Long-term Project operation and maintenance would require the long-term consumption of electricity that could otherwise be available to other power customers, and would add to the overall electrical demand in California. The proposed Project would produce energy from the additional water storage capacity, and would require power to pump the water as far south as southern California.

33.2.3 Construction Labor

Human effort would be irretrievably committed during the construction of the proposed Project. The proposed Project is expected to require an estimated average of 95 construction workers on an annual basis during the Project construction period.

33.2.4 Land Use Changes

The proposed Project (depending on alternative) would permanently affect up to approximately 26,500 acres of land from its existing land use (including the conversion of prime agricultural land to other uses) to a Project facility land use and/or open space buffer. In addition, Project implementation would require the relocation of human graves. The commitment of land would not necessarily be irreversible or irretrievable because the removal of the proposed Project facilities and the restoration of disturbed areas could return that land to Existing Conditions. However, the substantial costs and the loss of energy, recreational, and socioeconomic benefits from decommissioning and removing the proposed Project facilities would make removal of the Project facilities unlikely in the foreseeable future. Therefore, for the purposes of this discussion, the change in the land use at the proposed Project facility sites is considered irreversible and irretrievable. The relocation of graves that would be necessary to implement the Project is considered irreversible (i.e., although the graves would be relocated and buried in new locations, their connection with their existing setting would be irreversibly changed).

33.2.5 Landscape Character Changes

Implementation of any of the proposed Project's action alternatives would result in a change in the existing landscape character of the areas surrounding each Project facility site. This change in landscape character would not necessarily be irreversible or irretrievable because removal of the proposed Project and the restoration of disturbed areas could return the Project facility sites to Existing Conditions. However, as mentioned above, the substantial costs and the loss of energy, recreational, and socioeconomic benefits from decommissioning and removing the proposed Project facilities makes it unlikely that it would happen. Therefore, for the purposes of this discussion, the change in the landscape at the proposed Project facility sites is considered irreversible.

The permanent conversion of a vegetated landscape to the proposed Sites Reservoir, its associated facilities, and up to five campgrounds would be a major change to the landscape, and the reservoir would introduce a new permanent source of daytime and nighttime glare in the area. The proposed South Bridge across the new reservoir would introduce urban infrastructure in an area that is largely characterized by its rural open space, thus altering the visual character of the area. The proposed Terminal Regulating Reservoir would cover approximately 200 acres of existing agricultural land. The new waterbody would also be distinct to the area due to its height approximately six feet above the existing surrounding lands. The proposed Holthouse Reservoir would result in a major enlargement of the existing Funks Reservoir. All other associated proposed Project facilities would also change the landscapes at the individual facility locations.

In addition, new sources of permanent nighttime light would be required for safety purposes at most of the proposed Project facilities, including along the South Bridge and in the Recreation Areas. Vehicles traveling on the proposed South Bridge and the new roads, as well as visitors to the new campgrounds at Sites Reservoir, would also create a new source of nighttime light in the area.

33.2.6 Biological and Cultural Resources Impacts

The proposed Project would result in the removal and/or disturbance of vegetation at Project facility sites, with associated impacts on wildlife species that inhabit those areas. The proposed Project would affect existing wetlands at Project facility sites, and would also result in effects to aquatic biological species.

The proposed Project also would disturb cultural resources, including those that are eligible for the California Register of Historical Resources and the National Register of Historic Places, that currently exist within the footprints of the proposed Project facilities.

These effects to biological and cultural resources are all considered irreversible and irretrievable commitments of those resources.

33.3 Potential Environmental Accidents

The *CEQA Guidelines* also require a discussion of the potential for irreversible environmental damage caused by an accident associated with a project (AEP, 2011). Construction of the all of the proposed Project's action alternatives would result in the use, transport, storage, and disposal of hazardous wastes. DWR and Reclamation would require all construction, operation, and maintenance activities to comply with applicable federal, State, and local laws related to hazardous materials, which would significantly reduce the likelihood and severity of accidents that could cause irreversible environmental damage as a result of Project construction, operation, and maintenance.

In addition, because the potential exists for dams to fail, DWR prepared a potential dam break inundation map that reflects the inundation scenario associated with the proposed Sites Reservoir and its dams. The flood wave that would result from a hypothetical breach of Golden Gate Dam or Sites Dam has a small probability of occurring, but would present a significant hazard to both occupied and non-occupied structures downstream of the proposed Sites Reservoir.

The proposed Sites Reservoir dams would be designed and constructed pursuant to conservative guidelines and criteria designed to prevent failure. The design would incorporate multiple lines of defense or design redundancy. As required by the Division of Safety of Dams (DSOD), the dam would be designed to withstand the largest and strongest earthquake (Maximum Credible Earthquake), as well as the largest possible flood (Probable Maximum Flood). The proposed Sites Reservoir would include an emergency spillway to release flows with an elevation set to the potential probable maximum flood water surface elevation. Operation of Golden Gate and Sites dams would be monitored by instrumentation measuring such parameters as seepage, settlement, and earthquake-induced accelerations, which could provide early warning signs of potential dam failure. With modern design criteria and construction practices, combined with DSOD review, the probability of dam failure is extremely small. In addition, DSOD requires that large reservoirs, such as Sites Reservoir, have facilities capable of allowing rapid emergency drawdown of the water in the reservoir in the event of an unsafe condition at the dam. The proposed Sites Reservoir would accomplish this drawdown via the outlet tunnel in the proposed Sites Reservoir Inlet/Outlet Structure, which could discharge emergency release flows directly into Funks Creek; some of this drawdown could be attenuated by the proposed Holthouse Reservoir or released via the proposed Delevan Pipeline, the existing T-C Canal, or the existing GCID Canal.

33.4 Commitment of Future Generations to Similar Uses

As indicated previously for the impacts to existing graves within the footprint of the proposed Sites Reservoir and the landscape character of the proposed Project facility sites, the impacts of implementation of any of the proposed Project's action alternatives on these resources are considered irreversible. Similarly, the changes in land use and the impacts on biological and cultural resources from the implementation of any of the proposed Project's action alternatives are considered irreversible and irretrievable. These impacts are considered irreversible and irretrievable because once the proposed Project facilities are constructed and operational, it is not expected that the facilities would be decommissioned and demolished, and the land recontoured and restored to its existing condition, prior to the end of the proposed Project's lifespan (100 years). The proposed Project is expected to operate until the end of the Project lifespan due to the monetary investment that would be made to construct, operate, and maintain the Project, as well as the benefits that the Project would provide.

For these same reasons, implementation of any of the proposed Project's action alternatives would commit future generations to similar uses at the proposed Project facility sites. This proposed long-term commitment of lands for Project purposes is a change from Existing Conditions, but is not necessarily adverse. DWR and Reclamation would comply with all federal, State, and local laws, ordinances, regulations, and standards to minimize impacts on the environment during the proposed Project's construction, as well as during its long-term operation and maintenance.

33.5 References

Association of Environmental Professionals (AEP). 2011. 2011 California Environmental Quality Act (CEQA) Statute and Guidelines.

U. S. Bureau of Reclamation (Reclamation). 2012. Reclamation, Managing Water in the West. Reclamation's NEPA Handbook. February. Page 8-21.

34. Growth-Inducing Impacts

34.1 Introduction

This chapter presents an analysis of the potential growth-inducing impacts of the No Project/No Action Alternative and the three proposed Project action alternatives, Alternatives A, B, and C. To provide context for this assessment, this chapter also briefly describes population projections in the three study areas, which were presented in Chapter 22 Socioeconomics.

34.2 California Environmental Quality Act and National Environmental Policy Act Requirements

To comply with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), an Environmental Impact Report (EIR) and an Environmental Impact Statement (EIS), respectively, must discuss the ways in which the alternatives could result in indirect effects to the environment, including growth-inducing effects. This section briefly describes the CEQA and NEPA requirements related to growth-inducing impacts.

34.2.1 California Environmental Quality Act Requirements

CEQA requires that an EIR evaluate the growth-inducing impacts of a proposed project (California Public Resource Code Section 21100(b)(5)). The State CEQA Guidelines, Section 15126.2(d), state that an EIR should discuss the:

> *"Growth-Inducing Impact of the Proposed Project. Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment."*

Consideration of growth-inducing impacts pursuant to CEQA has been further described in *Napa Citizens for Honest Government v. Napa County Board of Supervisors* (2001) (91 Cal.App.4th 342, 367-371[110 Cal.Rptr.2d 579]) in which the California Court of Appeal, Fourth District stated:

> *"Neither CEQA itself, nor the cases that have interpreted it, require an EIR to anticipate and mitigate the effects of a particular project on growth in other areas. In circumstances such as these, it is sufficient that the final EIR (FEIR) warns interested persons and governing bodies of the probability that additional housing will be needed so that they can take steps to prepare for or address that probability. The FEIR need not forecast the impact that the housing will have on as yet unidentified areas and propose measures to mitigate that impact."*

34.2.2 National Environmental Policy Act Requirements

The EISs prepared by the Department of the Interior (DOI) agencies, including Reclamation, are prepared using regulations implementing NEPA as prepared by DOI and the Council on Environmental Quality (CEQ). The CEQ regulations require an EIS to consider indirect effects of a project, which are often related to growth-inducing effects (40 CFR 1508.8(b)), as described below:

> *"Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."*

34.3 Environmental Setting/Affected Environment

This analysis includes an Extended Study Area, Secondary Study Area, and a Primary Study Area, as described in more detail below.

34.3.1 Extended Study Area

The Extended Study Area includes the entire service areas of the State Water Project (SWP) and Central Valley Project (CVP). These two service areas are located within all or portions of the following 39 counties: Alameda, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Imperial, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, and Yolo. The proposed Project's primary objective of improved water supply reliability has the potential for long-term direct and indirect effects within those two service areas. The Extended Study Area is shown on Figure 1-6 in Chapter 1 Introduction.

34.3.2 Secondary Study Area

The Secondary Study Area is defined as the area of potential Project-related operational effects, including SWP and CVP facilities that could experience reservoir water surface elevation fluctuations and stream flow changes downstream from their facilities. Those facilities are located within the following 22 counties: Alameda, Butte, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Marin, Placer, Sacramento, San Francisco, San Mateo, Santa Clara, Shasta, Solano, Sonoma, Sutter, Tehama, Trinity, Yolo, and Yuba.

The potential operational changes could occur as a result of the coordinated and integrated operation of the proposed Project facilities with State and federal projects located on the American River, Trinity River, Sacramento River, Clear Creek, Spring Creek, Feather River, and the Sacramento-San Joaquin Delta (Delta). The Secondary Study Area is shown on Figure 1-8 in Chapter 1 Introduction.

34.3.3 Primary Study Area

The Primary Study Area is defined as the areas within Glenn and Colusa counties where short-term and long-term direct effects from constructing, operating, and/or maintaining proposed Project facilities may occur. This area includes the footprints of the proposed Sites Reservoir Inundation Area and the associated facilities (e.g., dams, bridge, regulating reservoirs, intakes/discharge facilities, pipelines, electrical transmission line, electrical distribution lines, pumping/generating plants, recreation areas, and new and relocated roads). The Primary Study Area is shown on Figures 1-9A, 1-9B, and 1-9C in Chapter 1 Introduction for Alternatives A, B, and C.

34.4 Project Components Potentially Related to Growth

A project could result in growth-inducing impacts through several means, including the removal of obstacles to population growth, or actions that encourage and facilitate other activities beyond those proposed by the project. Growth-inducing impacts are generally related to actions that could increase economic or population growth, including the need for additional housing or community services, that could result in direct or indirect changes in the environment in addition to direct impacts related to implementation of that project.

Direct growth inducement would occur if a project directly results in new permanent employment opportunities or new permanent residents, which would increase long-term demands for public services and utilities or result in changes to land use and potentially effects on other environmental resources.

Indirect growth inducement could occur if a project eliminates an obstacle to population growth or land development that currently prevents achievement of adopted growth projections, such as increased water supply availability. Indirect growth inducement also could occur if a project results in improved economic activity that causes population growth in excess of adopted growth projections. Potential impacts related to growth projections in adopted land use plans and growth management policies (e.g., transportation management plans) generally are addressed by measures to avoid or mitigate direct and indirect impacts to the extent feasible.

For this EIR/EIS, growth inducement is primarily related to expected changes in water supply reliability and/or water quality for agricultural, municipal, and industrial water users, as described below.

- **Improve water supply reliability for agricultural, urban, and environmental uses.** One primary objective of the proposed Project is to improve water supply reliability. Water supply reliability requires the delivery of specified amounts of water at predictable locations and times. During prolonged drought periods, water supplies are less reliable, which increases competition and can lead to conflict among users. This can be exacerbated by a lack of surface water storage due to increased environmental requirements, and reduced natural rainfall for agriculture. The proposed Project is intended to help ease the pressure on a system that is already having difficulty serving California's water needs. By providing additional surface water storage capacity to capture early runoff, additional fresh water would be available to improve water supply reliability.

- **Improve water quality.** The Delta is the diversion point for drinking water for millions of Californians, and is critical to California's agricultural economy. The proposed Project could improve water quality with increased flows by releasing high quality stored water into the Sacramento River during periods when Delta water quality is impaired.

- **Provide more options for water management.** The existing State and federal water systems, SWP and CVP, are relatively rigid in terms of timing, location, and how water is pumped from the Delta. Urban, agricultural, and environmental water needs have each increased and have created conflicting demands for limited water supplies. Water management flexibility can create a more rapid response to meeting these demands, but also for unexpected incidents, such as Delta levee breaks. Strategically located surface water storage would provide flexibility in the system for agricultural, environmental, and municipal and industrial users.

- **Increased recreational opportunities.** The proposed Project would include up to five new recreation areas. Collectively, recreation opportunities at the five recreation areas could provide: boating, camping, picnicking, fishing, swimming, and hiking. Depending on the recreation area, proposed facilities may include boat launch sites, trails, designated swimming and fishing access, picnic tables, shaded canopies, campfire rings/barbeques, vault toilets, and dumpsters.
- **Increased temporary and permanent employment opportunities.** The proposed Project would require part-time and full-time construction workers during its construction and operation. The proposed Project also would improve water supply reliability for agricultural water users in the Extended Study Area, which would increase agriculturally-related employment.

34.5 Environmental Impacts/Environmental Consequences

34.5.1 Regulatory Setting

The regulatory requirements pursuant to CEQA and NEPA are summarized in Section 34.2.

34.5.2 Evaluation Criteria and Significance Thresholds

The evaluation criteria used for this impact analysis represent thresholds that were used to identify whether an impact would be significant pursuant to CEQA. Although CEQA does not provide specific significance thresholds for Growth-Inducing Impacts, the proposed Project was evaluated based on the following general requirements of Section 15126.2(d) of CEQA and professional judgment that considered current regulations, standards, and knowledge of the area. For the purposes of this analysis, an alternative would result in a significant impact if it would result in any of the following:

- Growth that is not consistent with or accommodated by the land use plans and growth management plans and policies for the area affected.
- Secondary growth effects, including increased demand on community and public services and infrastructure, increased traffic and noise, and adverse environmental impacts, such as degradation of air and water quality and conversion of agricultural and open space land to developed uses.

Similar evaluation criteria were used for the environmental analysis pursuant to NEPA; however, levels of significance for impacts are not defined.

34.5.3 Impact Assessment Assumptions

This analysis necessarily takes a general approach to determining potential growth-inducing impacts of the proposed Project. The specific areas of delivery and end use of proposed Project water are unforeseeable and too speculative for site-specific analysis. Furthermore, the CEQA Guidelines do not require that an EIR predict (or speculate) specifically where such growth would occur, in what form it would occur, or when it would occur. The answers to such questions require speculation, which CEQA discourages (CEQA Guidelines Section 15145).

This impact assessment analyzes the effects of the proposed Project facilities listed above that could influence growth, including:

- Improved water supply reliability, water quality, and options for urban water supplies
- Additional recreational opportunities
- Increased temporary and permanent employment opportunities

34.5.3.1 Improved Water Supply Reliability, Water Quality, and Options for Urban Water Supplies

As described in Chapter 22 Socioeconomics, population projections have been developed for the Extended Study Area that would include urban areas that could use improved water supplies from the proposed Project. The causal link between improved water supply reliability (including conditions related to increased options for urban water supplies) and water quality and any increase in population or economic growth could be speculative because the specific location of users with improved water supply conditions and the quantitative incremental improvement is not known. Because this issue cannot be determined with certainty, for the purposes of this EIR/EIS, the assumption was made that improved water supply conditions could stimulate growth.

The potential to stimulate growth does not necessarily result in "growth-inducement" or secondary growth impacts that have not been provided for in existing land use, public works, utilities, and community services plans. The determination if the growth is to be considered "growth-inducing" has been analyzed with respect to the ability of existing water supplies to meet the demand of population projections in existing planning documents. Information provided to the California Department of Water Resources (DWR) through submittals of Urban Water Management Plans was used to determine if urban water supplies have adequate water supplies to meet the water demands for 2030 population growth projections.

34.5.3.2 Improved Recreational Opportunities

As described in Chapter 21 Recreation Resources and Chapter 22 Socioeconomics, estimates for increased recreational use and recreational employment have been developed for the proposed Project alternatives, and compared to Existing Conditions and the No Project/No Action Alternative. The increased recreational use and employment could stimulate growth. As described above, the potential to stimulate growth does not necessarily result in "growth-inducement" or secondary growth impacts that have not been provided for in existing land use, public works, utilities, and community services plans. The increase in recreation use and employment are discussed in this chapter relative to existing community plans.

34.5.3.3 Increased Temporary and Permanent Employment Opportunities

As described in Chapter 22 Socioeconomics, estimates for increased temporary and permanent employment opportunities have been developed for the proposed Project alternatives, and compared to Existing Conditions and the No Project/No Action Alternative. The increased employment could stimulate growth. As described above, the potential to stimulate growth does not necessarily result in "growth-inducement" or secondary growth impacts that have not been provided for in existing land use, public works, utilities, and community services plans. The increase in employment is discussed in this chapter relative to existing community plans.

It should be noted that DWR, Reclamation, and/or water supply agencies that are not part of cities cannot make local decisions regarding the extent and location of growth. Cities and counties are responsible for considering the environmental effects of their growth and land use planning decisions with appropriate mitigation measures in accordance with CEQA.

34.5.4 Growth-Inducing Impacts Associated with the No Project/No Action Alternative

34.5.4.1 Extended, Secondary, and Primary Study Areas – No Project/No Action Alternative

The No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009, as described in Chapter 3, Description of Proposed Project/Proposed Action and Alternatives and listed in Tables 3-1, 3-2, and 3-3. The impacts of the projects included in the No Project/No Action Alternative have already been evaluated on a project-by-project basis, pursuant to CEQA and/or NEPA, and their potential for growth-inducing impacts has been addressed in those environmental documents.

In addition, if the No Project/No Action Alternative is implemented, no facilities would be constructed pursuant to the proposed Project alternatives, resulting in no direct or indirect growth inducement within the three study areas related to those facilities.

Economic Growth Opportunities Related to Improved Water Supply Reliability, Water Quality, and Options for Urban Water Supplies

Changes in water supply reliability, water quality, and options for urban water supplies associated with implementation of the No Project/No Action Alternative would affect long-term average water deliveries and water deliveries. Historically, urban development depended upon the availability of long-term water supplies and would implement water conservation measures to maintain community services during Dry and Critical Dry years. In the future, water conservation measures would be included in long-term average water demand projections, and there would be fewer opportunities to reduce water demands without substantial effects to water users.

Expected water supply conditions with implementation of the No Project/No Action Alternative for urban water users within the Extended and Secondary study areas are difficult to define with specificity due to the wide range of water supplies, including surface water rights, groundwater resources, supplies from wastewater and stormwater reclamation, water transfers, water conservation, carryover storage in surface water reservoirs and groundwater aquifers, and ocean and brackish water desalination along the coastlines and in areas with brackish groundwater. Also, by 2020, the State has mandated the statewide reduction of urban water demand by 20 percent. Recently, more than 300 urban water agencies and private utilities submitted Urban Water Management Plans (UWMPs) to DWR that provide a broad perspective on water supplies through 2030. The UWMPs consider water demands following the reduction in statewide urban water demand by 2020, implementation of future water supplies, and the ability of water supplies to meet water demands in Normal, Single-Dry, and Multiple-Dry water years.

Many water supply agencies have indicated in their UWMPs that long-term average water supplies in Year 2030 would be managed at a level greater than long-term water demands, including storage of water during wetter years to be used during drier years. Overall, comparison of the long-term water supplies to the long-term water demands can be used to evaluate the potential for economic growth and for removal of obstacles to growth. The UWMPs include continuing implementation of existing water supply facilities and facilities that were under construction during preparation of this EIR/EIS, including water supply projects listed in Tables 3-1 and 3-2.

Information from representative UWMPs submitted to DWR by communities that could use water supplied through SWP or CVP conveyance facilities are summarized in Table 34-1. This table summarizes information presented in UWMPs submitted to DWR between 2010 and 2013 related to projected population, urban water use or demand in Normal water years, and urban water supplies in Normal water years. The values for urban water use in 2030 include assumptions related to the statewide 20 percent reduction in urban water use by 2020.

Table 34-1
Projected Population, Water Use, and Long-Term Water Supplies in Normal Water Years[a] for Major Communities in Water Delivery Regions that Use SWP and CVP Water Supplies

	Sacramento Valley[b]	San Joaquin Valley[c]	San Francisco Bay Area[d]	Central Coast[e]	Southern California[f]	TOTAL
2010 Population	1036,000	734,000	4,911,000	292,000	21,568,000	**28,541,000**
2030 Population	1,424,000	1,106,000	5,920,000	335,000	26,054,000	**34,839,000**
2010 Urban Water Use (Demand) in a “Normal” Water Year (af/yr)	359,000	374,000	1,088,000	29,000	4,689,000	**6,539,000**
2030 Urban Water Use (Demand) in a “Normal” Water Year (af/yr and % increase from 2010)	591,000 (64%)	390,000 (4%)	1,288,000 (18%)	28,000 (0)	5,306,000 (13%)	**7,603,000 (16%)**
2010 Urban Water Supplies in a “Normal” Water Year (af/yr)	690,000	383,000	1,304,000	43,000	5,496,000	**7,916,000**
2030 Urban Water Supplies in a “Normal” Water Year (af/yr and % increase from 2010)	852,000 (24%)	468,000 (22%)	1,386,000 (6%)	43,000 (0)	5,882,000 (7%)	**8,631,000 (9%)**

[a]Normal water years are defined as long-term average water year values, pursuant to the DWR “Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan.”

[b]Includes information from 2010 Urban Water Management Plans (UWMPs) for El Dorado Irrigation District, Folsom, Placer County Water Agency, Roseville, Sacramento County Water Agency, Sacramento Suburban Water District, San Juan Water District, West Sacramento, and Yuba City.

[c]Includes information from 2010 UWMPs for Fresno, Stockton, and Tracy.

[d]Includes information from 2010 UWMPs for Alameda County Water District, Contra Costa Water District, East Bay Municipal Utility District, Hollister, Napa, Santa Clara Valley Water District, Solano County Water Agency, and Zone 7 Water Agency.

[e]Includes information from 2010 UWMP for Central Coast Water Authority.

[f]Includes information from 2010 UWMPs for Antelope Valley-East Kern Water Agency, Coachella Valley Water District, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Metropolitan Water District of Southern California, Mojave Water Agency, Palmdale Water District, San Bernardino Valley, San Gorgonio Pass Water Agency, and Santa Clarita Valley (Castaic Lake Water Agency et al).

Notes:

af/yr = acre feet per year
CVP = Central Valley Project
SWP = State Water Project

Sources: ACWD, 2011; AVEK, 2011; CCWA, 2011; CCWD, 2011; CLAWA, 2011; CLWA et al., 2011; CVWD, 2011; DWA, 2011; EBMUD, 2011; EID, 2011; Folsom, 2011; Fresno, 2012; Hollister, 2011; Metropolitan, 2010; MWA, 2011; Napa, 2011; PCWA, 2011; PWD, 2011; Roseville, 2011; SBVWD et al., 2011; SCVWD, 2011; SCWA, 2011; SGPWA, 2010; SJWD, 2011; Solano CWA, 2011; SSWD, 2011; Stockton, 2011; Tracy, 2011; West Sacramento, 2011; Yuba City, 2011; and Zone 7, 2010.

The values in Table 34-1 indicate that, in Normal water years, water supplies are generally greater than urban water demand. The portion of water supplies not used in Normal or Wet years generally is directly or indirectly stored in surface water storage reservoirs or groundwater aquifers for use in drier years.

Information in the UWMPs indicates that water supplies can be substantially reduced in drier years, which require implementation of strict water conservation to continue to meet the water demands. Information from the UWMPs is used by land use planning agencies to determine if adequate water supplies exist for future population projections and land use development. The UWMPs generally indicate that existing and projected water supplies for the No Project/No Action Alternative are adequate for population projections in existing land use plans. The No Project/No Action Alternative includes facilities that were approved for construction or under construction during preparation of this EIR/EIS. The effects of implementation of those facilities are already included in adopted planning documents and UWMPs.

In summary, implementation of planned projects included in the No Project/No Action Alternative is not anticipated to result in growth-inducing effects in addition to those discussed in adopted general plans and associated environmental documentation in the Extended, Secondary, or Primary study areas because the water supply agencies are already planning on implementation of the facilities included in the No Project/No Action Alternative, including those related to improved water supply reliability, water quality, and options for urban water supplies.

Economic Growth Opportunities Related to Improved Recreational Opportunities

The No Project/No Action Alternative includes future projects that would either maintain or improve existing recreational opportunities within the Extended and Secondary study areas due to projected facilities. Additional recreational opportunities could occur due to increased fishing opportunities in the Sacramento Valley due to implementation of the projects included in the No Project/No Action Alternative. Most of the projects included in the No Project/No Action Alternative do not include specific facilities to improve recreational opportunities. The Oroville FERC License Renewal, Los Vaqueros Reservoir Expansion, Yolo Bypass Wildlife Area Land Management Plan, San Joaquin River Restoration, Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan, and North American Waterfowl Management Plan include actions that could improve recreational opportunities.

As described in Chapter 22 Socioeconomics, it is anticipated that, if the No Project/Action Alternative is implemented, recreation expenditure patterns in the Extended and Secondary study areas would be similar to those described for Existing Conditions. Growth in population is expected to cause growth in recreation economic activity. **Therefore, expected increased recreational opportunities in the Extended and Secondary study areas associated with implementation of the No Project/No Action Alternative are not anticipated to result in growth-inducing impacts not previously addressed in existing environmental documentation for adopted general plans.**

As described in Chapter 21, Recreation Resources, none of the projects and programs included in the No Project/No Action Alternative are or would be located within the Primary Study Area, or would directly or indirectly affect existing recreation opportunities in the Primary Study Area.

Economic Growth Opportunities Related to Increased Temporary and Permanent Employment

As described in Chapter 22 Socioeconomics, the No Project/No Action Alternative includes implementation of projects and programs being constructed, or those that have gained approval, as of June 2009. **The impacts of these projects have already been evaluated on a project by project basis, pursuant to CEQA and/or NEPA, and their potential to exceed established standards has been addressed in those environmental documents (e.g., the Oroville FERC License Renewal and Los**

Vaqueros Reservoir Expansion); therefore, these projects are not anticipated to result in growth-inducing impacts.

34.5.5 Growth-Inducing Impacts Associated with Alternative A

34.5.5.1 Extended, Secondary, and Primary Study Areas – Alternative A

Implementation of Alternative A is expected to improve water supply reliability, increase water supply, improve water quality and provide water management flexibility in the Extended, Secondary, and Primary study areas. Alternative A is also expected to provide increased employment and recreational opportunities. The potential of Alternative A to induce growth is discussed below.

Economic Growth Opportunities Related to Improved Water Supply Reliability, Water Quality, and Options for Urban Water Supplies

Improved water supply reliability, water quality, and options for urban water supplies would affect long-term average water deliveries and water deliveries in Dry and Critical water years. Historically, urban development depended upon the availability of long-term water supplies, and urban users would implement water conservation measures to maintain community services during Dry and Critical Dry years. In the future, water conservation measures would be included in long-term average water demand projections, and there would be fewer opportunities to reduce water demands without substantial effects to water users. Therefore, many water supply agencies have indicated in their UWMPs that long-term average water supplies would be managed at a level greater than long-term water demands to allow for storage of water to be used during Dry and Critical Dry years. Overall, comparison of the long-term water supplies to the long-term water demands can be used to evaluate the potential for economic growth and for removal of obstacles to growth.

With implementation of Alternative A, long-term average CVP water deliveries to municipal and industrial (M&I) water users (primarily located in urban communities) in the Sacramento Valley and San Francisco Bay Area could increase by 29 to 151 percent, when compared to Existing Conditions (refer to Table 6-118[1]). However, that increase in water deliveries could occur with implementation of the No Project/No Action Alternative (refer to Table 6-37) and not be related to implementation of Alternative A. With Alternative A, M&I water deliveries for the CVP could increase zero to one percent, when compared to the No Project/No Action Alternative (refer to Table 6-119).

With Alternative A, long-term average SWP water deliveries to M&I water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California could increase by one to nine percent, when compared to Existing Conditions (refer to Table 6-120). A portion of that increase could occur with implementation of the No Project/No Action Alternative (refer to Table 6-38) and not be related to implementation of Alternative A. With implementation of Alternative A, M&I water deliveries for the SWP could increase five to six percent, when compared to the No Project/No Action Alternative (refer to Table 6-121).

Similar increases in Dry and Critical Dry water year deliveries are projected with implementation of Alternative A, when compared to the No Project/No Action Alternative, as described in Chapter 6 Surface Water Resources.

[1] All tables "6-XX" refer to tables in Chapter 6 Surface Water Resources.

Changes in long-term average water deliveries of one to six percent with implementation of Alternative A, when compared to the No Project/No Action Alternative, are similar or substantially less than the anticipated increase of 6 to 39 percent in long-term average water supplies for major urban water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California (refer to Table 34-1). As discussed in Chapter 22 Socioeconomics, implementation of Alternative A could be used to avoid the implementation of other more expensive water supplies that are included in the future assumptions for the UWMPs.

Reduced M&I water supply costs does not necessarily imply a rise in local economic activity. If the cost savings are spent on other goods and services within the local or regional economy, economic growth could be increased. However, if most of the savings are spent outside the local or regional economy, the benefits may not be realized. Because the cost savings could be small relative to the urban economy, and the spending patterns are uncertain, the economic benefits that could occur with implementation of Alternative A would result in a minor growth effect.

Increased water deliveries to agricultural water users in the Extended Study Area are not expected to be growth inducing, and could reduce the potential to change adopted land use plans that would allow conversion of agricultural lands to urban uses. This is because increased agricultural water deliveries, expected with implementation of Alternative A, could range from zero to three percent, when compared to Existing Conditions, and zero to five percent, when compared to the No Project/No Action Alternative (refer to Tables 6-118 through 6-121). Although the expected increased water supply deliveries could result in increased employment and other economic benefits, the effects on housing and population are expected to be minor in the Extended Study Area, when compared to the total housing and population (refer to Chapter 22 Socioeconomics).

In summary, expected improved water supply reliability, water quality, and options for urban water supplies associated with implementation of Alternative A are not anticipated to result in growth-inducing effects through improved economic growth in the Extended, Secondary, or Primary study areas.

Economic Growth Opportunities Related to Improved Recreational Opportunities

Implementation of Alternative A is expected to provide additional recreational opportunities within the Primary Study Area. Total recreation visitation is anticipated to increase by more than 358,000 annual visits, increasing non-local recreation expenditures to approximately $2.9 million (refer to Table 22-36[2]). **Expected increased recreation expenditures associated with implementation of Alternative A would represent less than 0.2 percent of total industrial expenditures in the Primary Study Area and are not anticipated to increase growth within the entire Primary Study Area.**

Increased recreational visits could result in additional demands for public services and utilities, including the use of roadways and utilities. As described in Chapter 26 Navigation, Transportation, and Traffic, the expected increase in recreational visits would not increase traffic in excess of existing acceptable levels of service of existing roadways, with the implementation of mitigation measures (refer to Table 26-20). Alternative A would not be expected to result in the need to expand roadways which could also support future growth, as described in Chapter 26 Navigation, Transportation, and Traffic. Increased demands on public services and utilities with implementation of Alternative A also would not be expected to result in

[2] All tables "22-XX" refer to tables in Chapter 22 Socioeconomics.

the need for expanded infrastructure which could also support future growth, as described in Chapter 29 Public Services and Utilities. However, increased recreation use could adversely affect public services due to increased traffic. The expected increase in traffic would result in a less-than-significant impact with implementation of mitigation measures (refer to Table 29-9). **Therefore, the expected increased recreational opportunities in the Primary Study Area associated with implementation of Alternative A are not anticipated to result in growth-inducing impacts.**

Economic Growth Opportunities Related to Increased Temporary and Permanent Employment

Implementation of Alternative A could result in an increase of 72 jobs in the agricultural sector in the Extended Study Area due to the expected increased water supply reliability (refer to Table 22-26). **The expected magnitude of the impacts would be less than one percent, when compared to the regional economy of the Extended Study Area, and is not anticipated to result in growth-inducing impacts.**

Implementation of Alternative A is expected to provide additional employment opportunities in the Primary Study Area for both construction and operation/maintenance of the proposed Project facilities. Implementation of Alternative A could result in 581 additional temporary jobs (primarily due to construction of the proposed facilities pursuant to Alternative A) and 59 additional permanent jobs (primarily for the proposed water supply facilities operation and recreational facilities), when compared to the No Project/No Action Alternative (refer to Tables 22-33 and 22-34). The majority of the temporary jobs would be associated with construction. It is anticipated that most of the construction jobs would be filled from within the Primary Study Area. However, construction may require specialized worker skills not readily available in the local labor pool. As a result, it is anticipated that some of the non-local workers would travel from outside the two-county Primary Study Area. Considering the multi-year duration of construction, it is anticipated that 20 percent of the imported workers would relocate to the two-county region, adding to the local population. It is anticipated that all of the workers required for operation would relocate to the two-county region. This additional population from construction and operation would constitute a minor increase in the total 2020 projected regional population of 64,605 and would not pose a burden on local public services, utilities, or infrastructure. In addition, these jobs would represent less than a one percent increase in the total labor force in the Primary Study Area, as described in Chapter 22 Socioeconomics.

Most of the construction and operation workforce would most likely commute daily to the proposed Project site from within the two-county region; however, if needed, there are approximately 2,000 available housing units to accommodate workers who may choose to commute to the proposed Project site on a workweek basis or who may choose to relocate to the region, as described in Chapter 22 Socioeconomics. In addition to the available housing units, there are recreational vehicle parks within the two-county region to accommodate construction workers. As a result, construction and operation of the proposed Project is not expected to increase the demand for housing within the two-county region. Within specific local communities, there could be localized effects on housing during proposed Project construction. However, given the availability of housing within the two-county region, predicting where this impact may occur would be highly speculative.

As described above and Chapter 22 Socioeconomics, construction and operation of Alternative A would be expected to result in a minor increase in jobs and population in the Primary Study Area which could be accommodated within available housing units. **An adequate housing supply exists to accommodate the**

change in population, and as such, this expected increase associated with implementation of Alternative A is not anticipated to be growth inducing.

Removing Obstacles to Growth

A variety of factors indirectly influence business, residential, and population growth in a region. Among these are General Plans and policies, and the availability of public utility services, public schools, and transportation services. Water is one of the primary public services needed to support urban development, including businesses, industry (including agriculture), and housing. If a deficiency in water service capacity constrains future development, then improving water supply reliability and increasing water supply would remove a physical impediment to planned development and result in growth-inducing impacts.

However, as described above, the expected increase in water yield associated with implementation of Alternative A would be within the range of projected increases of water supplies by major urban water users in their recent UWMPs to provide adequate water supplies for planned growth. The expected additional water deliveries associated with implementation of Alternative A to urban water users probably could be considered as replacement water supplies instead of implementing other projects identified in the UWMPs. A portion of the expected improved water supply reliability also could be used for agricultural water supplies or to improve environmental conditions in specific streams. However, because the UWMPs have identified adequate water supplies to meet future water demands in 2030 for the Long-Term average and Dry and Critical Dry year conditions, it does not appear that growth is currently being adversely affected due to lack of water supplies in these major urban communities. **Implementation of Alternative A is not anticipated to result in the removal of obstacles to growth, and therefore, is not anticipated to result in growth-inducing impacts.**

It should be noted that DWR, Reclamation, and/or water supply agencies that are not part of cities cannot make local decisions regarding the extent and location of growth. Cities and counties that could receive water from the proposed Project are responsible for considering the environmental effects of their growth and land use planning decisions. When new developments are proposed, the cities and counties must prepare environmental documents pursuant to CEQA; and where appropriate, these agencies must consider mitigation measures to reduce adverse impacts of the growth and/or overriding considerations.

34.5.6 Growth-Inducing Impacts Associated with Alternative B

34.5.6.1 Extended, Secondary, and Primary Study Areas – Alternative B

Similar to Alternative A, implementation of Alternative B would be expected to improve water supply reliability, increase water supply, improve water quality, and provide water management flexibility in the Extended, Secondary, and Primary study areas. Implementation of Alternative B would also be expected to provide increased employment and recreational opportunities. The potential of Alternative B to induce growth is discussed below.

Economic Growth Opportunities Related to Improved Water Supply Reliability, Water Quality, and Options for Urban Water Supplies

The expected long-term average CVP water deliveries to M&I water users in the Sacramento Valley and San Francisco Bay Area associated with implementation of Alternative B would be similar to those described for Alternative A. The expected increase would be from 29 to 149 percent, when compared to

Existing Conditions, rather than the 29 to 151 percent increase associated with Alternative A. This increase in water deliveries could occur with implementation of the No Project/No Action Alternative and not be related to implementation of Alternative B. With Alternative B implementation, expected M&I water deliveries for the CVP would be similar to water deliveries described for the No Project/No Action Alternative and Alternative A.

With Alternative B implementation, long-term average SWP water deliveries to M&I water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California could increase by one to nine percent, when compared to Existing Conditions (i.e., the same as described for Alternative A). A portion of that increase could occur with implementation of the No Project/No Action Alternative and not be related to implementation of Alternative B. With implementation of Alternative B, M&I water deliveries for the SWP could increase five to six percent (the same as for Alternative A), when compared to the No Project/No Action Alternative.

Similar increases in Dry and Critical Dry water year deliveries are projected with implementation of Alternative B, when compared to expected increases with implementation of the No Project/No Action Alternative and Alternative A.

Expected changes in long-term average water deliveries of one to six percent with implementation of Alternative B, when compared to the No Project/No Action Alternative, are similar or substantially less than the anticipated increase of 6 to 39 percent in long-term average water supplies for major urban water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California. This change is the same as was described for Alternative A.

Similar to that described for Alternative A, because the water supply cost savings could be small relative to the urban economy and the spending patterns are uncertain, the economic benefits that could occur with Alternative B implementation would be expected to result in a minor growth effect.

Expected increased agricultural water deliveries associated with implementation of Alternative B could range from zero to one percent (whereas it would be expected to range from zero to three percent with Alternative A implementation), when compared to Existing Conditions, and zero to six percent (whereas it would be expected to range from zero to five percent with Alternative A implementation), when compared to the No Project/No Action Alternative. Similar to that described for Alternative A, although the increased water supply deliveries could result in increased employment and other economic benefits, the effects on housing and population are expected to be minor in the Extended Study Area, when compared to the total housing and population.

In summary, similar to that described for Alternative A, expected improved water supply reliability, water quality, and options for urban water supplies associated with implementation of Alternative B is not anticipated to result in growth-inducing effects through improved economic growth in the Extended, Secondary, or Primary study areas.

Economic Growth Opportunities Related to Improved Recreational Opportunities

Similar to that described for Alternative A, Alternative B would be expected to provide additional recreational opportunities within the Primary Study Area, i.e., recreation visitation is anticipated to increase by more than 355,000 annual visits with Alternative B implementation, and 358,000 visits with Alternative A implementation, increasing non-local recreation expenditures to approximately $2.9 million. **Similar to Alternative A, the expected increased recreation expenditures associated**

with implementation of Alternative B would represent less than 0.2 percent of total industrial expenditures in the Primary Study Area and are not anticipated to increase growth within the entire Primary Study Area.

Similar to that described for Alternative A, increased recreational visits could result in additional demands for public services and utilities, including the use of roadways and utilities. The expected increase in recreational visits would not increase traffic in excess of existing acceptable levels of service of existing roadways, with the implementation of mitigation measures (refer to Table 26-20), and Alternative B implementation would not be expected to result in the need to expand roadways which could also support future growth, as described in Chapter 26 Navigation, Transportation, and Traffic. Expected increased demands on public services and utilities associated with implementation of Alternative B would also not be expected to result in the need for expanded infrastructure which could also support future growth, as described in Chapter 29 Public Services and Utilities. However, increased recreation use could adversely affect public services due to expected increased traffic. The expected increase in traffic would result in less than significant impacts with implementation of mitigation measures (refer to Table 29-9). **Therefore, similar to that described for Alternative A, the expected increased recreational opportunities in the Primary Study Area associated with implementation of Alternative B are not anticipated to result in growth-inducing impacts.**

Economic Growth Opportunities Related to Increased Temporary and Permanent Employment

Implementation of Alternative B could result in an increase of 60 jobs in the in the agricultural sector of the Extended Study Area due to the expected increased water supply reliability, whereas, Alternative A implementation could result in an increase of 72 jobs. **Similar to that described for Alternative A, the expected magnitude of the impacts associated with implementation of Alternative B would be less than one percent, when compared to the regional economy of the Extended Study Area, and is not anticipated to result in growth-inducing impacts.**

Implementation of Alternative B could result in 587 additional temporary jobs (primarily due to construction of the proposed facilities pursuant to Alternative B) and 53 additional permanent jobs (primarily for the proposed water supply facilities operation and recreational facilities), when compared to the No Project/No Action Alternative. In comparison, implementation of Alternative A could result in 581, 59, and 23 additional jobs, respectively. Similar to that described for Alternative A, the expected additional population from construction and operation would constitute a minor increase in the total 2020 projected regional population and would not pose a burden on local public services, utilities, or infrastructure. In addition, similar to that described for Alternative A, these jobs would represent less than a one percent increase in the total labor force in the Primary Study Area.

Construction and operation of the proposed Project is not expected to increase the demand for housing within the two-county region. Similar to that described for Alternative A, within specific local communities, there could be localized effects on housing during construction. However, given the availability of housing within the two-county region, predicting where this impact may occur would be highly speculative.

Similar to Alternative A, construction and operation of Alternative B would be expected to result in a minor increase in jobs and population in the Primary Study Area which could be accommodated within available housing units. **An adequate housing supply exists to accommodate the change in population**

and as such, this expected increase associated with implementation of Alternative B is not anticipated to be growth-inducing.

Removing Obstacles to Growth

Similar to that described for Alternative A, the expected increase in water yield with implementation of Alternative B would be within the range of projected increases of water supplies by major urban water users in their recent UWMPs to provide adequate water supplies for planned growth, and additional water deliveries associated with Alternative B implementation to urban water users probably could be considered as replacement water supplies instead of implementing other projects identified in the UWMPs. A portion of the expected improved water supply reliability also could be used for agricultural water supplies or to improve environmental conditions in specific streams. Because the UWMPs have identified adequate water supplies to meet future water demands in 2030 for the Long-Term average and Dry and Critical Dry year conditions, it does not appear that growth is being adversely affected due to lack of water supplies in these major urban communities. **Implementation of Alternative B is not anticipated to result in the removal of obstacles to growth, and therefore, is not anticipated to result in growth-inducing impacts.**

As indicated for Alternative A, DWR, Reclamation, and/or water supply agencies that are not part of cities cannot make local decisions regarding the extent and location of growth. Cities and counties that could receive water from the proposed Project are responsible for considering the environmental effects of their growth and land use planning decisions. When new developments are proposed, the cities and counties must prepare environmental documents pursuant to CEQA; and where appropriate, these agencies must consider mitigation measures to reduce adverse impacts of the growth and/or overriding considerations.

34.5.7 Growth-Inducing Impacts Associated with Alternative C

34.5.7.1 Extended, Secondary, and Primary Study Areas – Alternative C

Similar to that described for Alternative A, implementation of Alternative C would be expected to improve water supply reliability, increase water supply, improve water quality, and provide water management flexibility in the Extended, Secondary, and Primary study areas. Alternative C implementation would also be expected to provide increased employment and recreational opportunities. The potential of Alternative C to induce growth is discussed below.

Economic Growth Opportunities Related to Improved Water Supply Reliability, Water Quality, and Options for Urban Water Supplies

With implementation of Alternative C, long-term average CVP water deliveries to M&I water users (primarily located in urban communities) in the Sacramento Valley and San Francisco Bay Area could increase by 29 to 151 percent, when compared to Existing Conditions (i.e., the same as described for Alternative A). That increase in water deliveries could occur with implementation of the No Project/No Action Alternative and not be related to implementation of Alternative C. With Alternative C implementation, expected M&I water deliveries for the CVP would be similar to water deliveries described for the No Project/No Action Alternative and Alternative A.

With Alternative C implementation, long-term average SWP water deliveries to M&I water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California could increase by 1 to 10 percent, when compared to Existing Conditions, whereas Alternative A implementation could result in a one to nine percent increase. A portion of that increase could occur with implementation of the No Project/No Action Alternative and not be related to implementation of Alternative C. With implementation of Alternative C, M&I water deliveries for the SWP could increase five to seven percent, when compared to the No Project/No Action Alternative, whereas Alternative A implementation could result in a five to six percent increase.

Similar increases in Dry and Critical Dry water year deliveries are projected with implementation of Alternative C, when compared to the No Project/No Action Alternative and Alternative A.

Expected changes in long-term average water deliveries of one to six percent with implementation of Alternative C, when compared to the No Project/No Action Alternative, are similar or substantially less than the anticipated increase of 6 to 39 percent in long-term average water supplies for major urban water users in the Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California. This is the same as was described for Alternative A.

Similar to that described for Alternative A, because the water supply cost savings could be small relative to the urban economy and the spending patterns are uncertain, the economic benefits that could occur with implementation of Alternative C would be expected to result in a minor growth effect.

Expected increased agricultural water deliveries associated with implementation of Alternative C could range from zero to two percent (whereas it could range from zero to three percent with Alternative A implementation), when compared to Existing Conditions, and zero to five percent (i.e., the same as described for Alternative A), when compared to the No Project/No Action Alternative. Similar to that described for Alternative A, although the increased water supply deliveries could result in increased employment and other economic benefits, the effects on housing and population are expected to be minor in the Extended Study Area, when compared to the total housing and population.

In summary, similar to that described for Alternative A, expected improved water supply reliability, water quality, and options for urban water supplies associated with implementation of Alternative C is not anticipated to result in growth-inducing effects through improved economic growth in the Extended, Secondary, or Primary study areas.

Economic Growth Opportunities Related to Improved Recreational Opportunities

Similar to that described for Alternative A, implementation of Alternative C would be expected to provide additional recreational opportunities within the Primary Study Area, i.e., recreation visitation is anticipated to increase by more than 370,000 annual visits with Alternative C implementation, and 358,000 visits with Alternative A implementation, increasing non-local recreation expenditures by between approximately $2.9 million and approximately $3.0 million. **Similar to that described for Alternative, A, the expected increased recreation expenditures associated with implementation of Alternative C would represent less than 0.2 percent of total industrial expenditures in the Primary Study Area and are not anticipated to increase growth within the entire Primary Study Area.**

Similar to that described for Alternative A, expected increased recreational visits associated with implementation of Alternative C could result in additional demands for public services and utilities, including the use of roadways and utilities. The expected increase in recreational visits would not increase traffic in excess of existing acceptable levels of service of existing roadways, with the implementation of mitigation measures (refer to Table 26-20), and Alternative C implementation would not be expected to result in the need to expand roadways which could also support future growth, as described in Chapter 26 Navigation, Transportation, and Traffic. Increased demands on public services and utilities with implementation of Alternative C would also not be expected to result in the need for expanded infrastructure which could also support future growth, as described in Chapter 29 Public Services and Utilities. However, increased recreation use could adversely affect public services due to increased traffic. The expected increase in traffic would result in less than significant impacts with implementation of mitigation measures (refer to Table 29-9). **Therefore, similar to that described for Alternative A, the expected increased recreational opportunities in the Primary Study Area associated with implementation of Alternative C are not anticipated to result in growth-inducing impacts.**

Economic Growth Opportunities Related to Increased Temporary and Permanent Employment

Implementation of Alternative C could result in an increase of 77 jobs in the agricultural sector in the Extended Study Area due to increased water supply reliability, whereas, Alternative A could result in an increase of 72 jobs. **Similar to that described for Alternative A, the expected magnitude of the impacts associated with implementation of Alternative C would be less than one percent, when compared to the regional economy of the Extended Study Area, and is not anticipated to result in growth-inducing impacts.**

Implementation of Alternative C could result in 648 additional temporary jobs (primarily due to construction of the proposed facilities pursuant to Alternative C) and 60 additional permanent jobs (primarily for the proposed water supply facilities operation and recreational facilities), when compared to the No Project/No Action Alternative. In comparison, implementation of Alternative A could result in 581, 59, and 23 additional jobs, respectively. Similar to that described for Alternative A, the expected additional population from construction and operation would constitute a minor increase in the total 2020 projected regional population and would not pose a burden on local public services, utilities, or infrastructure. In addition, similar to that described for Alternative A, these jobs would represent less than a one percent increase in the total labor force in the Primary Study Area. Construction and operation of the proposed Project is not expected to increase the demand for housing within the two-county region. Similar to that described for Alternative A, within specific local communities, there could be localized effects on housing during construction. However, given the availability of housing within the two-county region, predicting where this impact may occur would be highly speculative.

Similar to that described for Alternative A, construction and operation associated with implementation of Alternative C would be expected to result in a minor increase in jobs and population in the Primary Study Area which could be accommodated within available housing units. **An adequate housing supply exists to accommodate the change in population and as such, this expected increase associated with implementation of Alternative C is not anticipated to be growth-inducing.**

Removing Obstacles to Growth

Similar to that described for Alternative A, the expected increase in water yield associated with implementation of Alternative C would be within the range of projected increases of water supplies by major urban water users in their recent UWMPs to provide adequate water supplies for planned growth, and additional water deliveries associated with Alternative C implementation to urban water users probably could be considered as replacement water supplies instead of implementing other projects identified in the UWMPs. A portion of the expected improved water supply reliability also could be used for agricultural water supplies or to improve environmental conditions in specific streams. Because the UWMPs have identified adequate water supplies to meet future water demands in 2030 for the Long-Term average and Dry and Critical Dry year conditions, it does not appear that growth is being adversely affected due to lack of water supplies in these major urban communities. **Implementation of Alternative C is not anticipated to result in the removal of obstacles to growth, and therefore, is not anticipated to result in growth-inducing impacts.**

As indicated for Alternative A, DWR, Reclamation, and/or water supply agencies that are not part of cities cannot make local decisions regarding the extent and location of growth. Cities and counties that could receive water from the proposed Project are responsible for considering the environmental effects of their growth and land use planning decisions. When new developments are proposed, the cities and counties must prepare environmental documents pursuant to CEQA; and where appropriate, these agencies must consider mitigation measures to reduce adverse impacts of the growth and/or overriding considerations.

34.6 Mitigation Measures

Because no significant or potentially significant impacts were identified, no mitigation is required or recommended.

34.7 References

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Santa Clara Valley Water District (SCVWD). 2011. *2010 Urban Water Management Plan*. May.

Solano County Water Agency (Solano CWA). 2011. *2010 Solano County Water Agency Urban Water Management Plan – Final Draft*. December.

Zone 7 Water Agency (Zone 7). 2010. *2010 Urban Water Management Plan*. December.

35. Cumulative Impacts

35.1 Introduction

Cumulative impacts are impacts on the environment that result from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions (CEQA Guidelines section 15355[b], 40 CFR 1508.7). Such impacts can result from individually minor but collectively significant actions taking place over time. This chapter presents the methodology used to evaluate cumulative effects, lists related projects and describes their relationship to the proposed Project, identifies cumulative impacts by resource area, and recommends measures to mitigate significant cumulative effects. The cumulative impact analysis uses both quantitative tools (i.e. hydrologic modeling) and qualitative assessments to determine the potential combined impacts of the proposed Project and other related projects.

35.1.1 Regulatory Setting

The California Code of Regulations' Guidelines for the Implementation of the California Environmental Quality Act (CEQA Guidelines) and federal National Environmental Policy Act (NEPA) regulations require that the cumulative impacts of a proposed project be addressed in an Environmental Impact Report/Environmental Impact Statement (EIR/EIS).

35.1.2 CEQA Requirements

Under CEQA, an EIR is required to discuss the cumulative impacts of a project when the project's incremental effect is cumulatively considerable (CEQA Guidelines section 15130(a)(1)). "Cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines section 15065(a)(3); Public Resources Code section 21083(b)(2)). Cumulative impacts are further defined in the CEQA Guidelines as two or more individual impacts that, even if individually minor, when considered together, are considerable or that compound or increase other environmental impacts (see CEQA Guidelines section 15355).

Per Section 15130 of the CEQA Guidelines, the discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute, rather than the attributes of other projects which do not contribute to the cumulative impact.

35.1.3 NEPA Requirements

Under NEPA, the Council of Environmental Quality (CEQ) regulations define cumulative impacts as the impact on environment, human, and community resources that result from the incremental impact of the proposed Project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal on non-federal) or persons undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time (40 CFR 1508.7, 1508.25.).

Reclamation's NEPA Handbook states that future cumulative impacts should not be speculative but should be based upon known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable (Reclamation 2012).

35.2 Methodology

The methodology used to identify and evaluate cumulative impacts in this DEIR/EIS was based upon both CEQA and NEPA requirements. For purposes of this DEIR/EIS, a cumulative impact was considered to be a change in the physical environment that would result from the combined implementation of the proposed Project or one of the alternatives with other projects that would cause related impacts. Cumulative impacts within the proposed Project's three study areas were identified based on: (1) information extracted from existing environmental documents or studies for the resource categories potentially affected by each project, (2) investigation of future project plans by other State and federal agencies and private entities, and (3) knowledge of expected effects of similar projects.

The cumulative analysis followed applicable guidance provided by CEQ in Considering Cumulative Effects under NEPA (CEQ 1997), Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ 2005), Reclamation's NEPA Handbook (Reclamation 2012), and Guidelines for Implementation of the California Environmental Quality Act. Based on these resources, the following elements were determined necessary to provide an adequate discussion of significant cumulative impacts:

1. Either: a) a list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or b) a summary of projections contained in an adopted local, regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect.
2. When utilizing a list, factors to consider when determining whether to include a related project should include the nature of each environmental resource being examined, the location of the project and its type.
3. A definition of the geographic scope of the area affected by the cumulative effect and a reasonable explanation for the geographic limitation used.
4. A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available; and
5. A reasonable analysis of the cumulative impacts of the relevant projects, including examining reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

This cumulative impact assessment considered projects and programs ("projects") identified under Existing Conditions (which includes the current effects of past projects) and reasonably foreseeable and probable future projects. The criterion for considering whether a project was reasonably foreseeable and probable in this DEIR/EIS was whether the project had been defined in adequate detail, either through the completion of publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents, to estimate potential impacts. Projects that were only in the development phase without detailed descriptions, operations criteria, or general locations as of April 2013 were not considered further.

35.3 Cumulative Project Selection

As discussed above, to identify the related cumulative projects, CEQA recommends either the “list” or “projection” approach. The list approach was used for this analysis.

For this DEIR/EIS, cumulative impacts within the proposed Project’s study areas were identified based on: (1) assumptions developed as part of CALSIM II water supply modeling; (2) cumulative projects described in the CALFED Bay-Delta Program (CALFED) Programmatic EIS/EIR, and (3) information extracted from existing environmental documents or future project plans for similar projects. In addition, the following criteria, taken from the CALFED Programmatic EIS/EIR, were used to narrow the list of projects considered in the analysis:

- The action is under active consideration.
- The action’s project-level environmental documentation is under preparation or has been completed.
- The action would be completed or operational within the timeframe being considered for the proposed Project (assumed to be 2020).
- The action, in combination with the proposed Project, would have the potential to affect the same resources. For example, the proposed Project would affect flow regimes and water quality along the Sacramento River and in the Sacramento-San Joaquin Delta (Delta). These potential changes, along with ecosystem restoration and/or water quality improvement programs in the Delta, could have a cumulative effect; therefore, the programs in the Delta were included in the cumulative analysis. In contrast, ongoing and future Delta levee repair/improvement projects to maintain existing flood channels or navigation channels or general plan updates/amendments for Delta counties in combination with the proposed Project are not anticipated to cause a cumulative effect and were not included in the discussion of cumulative impacts.

35.3.1 Cumulative Projects described in CALFED EIS/EIR

The CALFED Programmatic EIS/EIR compiled a list of major projects for consideration in its cumulative impact analysis. The list focused on future actions that could affect the physical features of the San Francisco Bay-Delta (Bay-Delta) system, and on the future federal and State policies that could affect operations of the Central Valley Project (CVP) and State Water Project (SWP). The CALFED Programmatic EIS/EIR list of cumulative projects, the CALFED Record of Decision (ROD), and other recent documents were used to identify projects considered in the cumulative effect analysis.

Many of the projects considered in the cumulative impacts analysis in the CALFED Programmatic EIS/EIR have been implemented, modified into other projects, or not pursued based upon results of separate evaluations, including:

- American River Water Resource Investigation (not pursued as a regional project)
- American River Watershed Project (construction either completed or underway – future projects will not affect water supply operations)
- Contra Costa Water District Multi-Purpose Pipeline Project (completed)
- Hamilton City Pumping Plant Fish Screen Improvement Project (completed)

- Montezuma Wetlands Project (long-term project underway for disposal of dredge spoils)
- Pardee Reservoir Enlargement (not pursued)
- Red Bluff Diversion Dam Fish Passage Improvement Project (completed)
- Sacramento River Flood Control System Evaluation (completed)
- Sacramento County CVP Water Service Contracts (completed)
- West Delta Water Management Program (not pursued)

The projects identified as cumulative projects in the CALFED Programmatic EIS/EIR that are considered in this cumulative effects analysis, and described in the following subsection, include:

- Implementation of Central Valley Project Improvement Act (CVPIA) actions
- Delta Wetlands
- South Delta Temporary Barriers
- Sacramento Water Forum Process (underway through Lower American River Flow Management Study)
- Trinity River Restoration Actions
- East Bay Municipal Utility District (EBMUD) Supplemental Water Supply Project

35.3.2 Program List of Related and Reasonably Foreseeable Projects and Actions

Table 35-1 lists projects considered for the cumulative effects section by resource area. Summaries of each project or action are provided below.

The projects and actions are organized in the following order:

- Multi-Region Projects and Actions
- Local Agency Projects and Actions in the vicinity of proposed North-of-the-Delta Offstream Storage (NODOS) Project facilities
- Water Supply, Water Quality, and Hydropower Projects and Actions in the vicinity of proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations (organized geographically from north to south)
- Ecosystem Improvement Projects and Actions in the vicinity of proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations (organized geographically from north to south)

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Multi-Regional Projects and Actions																								
Implementation of CVPIA	X			X	X	X	X	X				X	X	X	X	X							X	
Implementation of CALFED Objectives	X			X	X	X	X	X				X	X	X	X	X							X	
Bay-Delta Water Quality Control Plan Update	X	X	X	X	X	X	X	X					X	X	X	X								X
Bay Delta Conservation Plan	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Delta Plan	X		X	X	X	X	X	X					X	X	X	X							X	
NMFS Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead	X	X		X	X	X	X	X					X	X	X	X								X
USFWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes	X	X		X	X	X	X	X					X	X	X	X								X
Anadromous Fish Screen Program					X				X	X	X					X	X				X		X	
California Aquatic Invasive Species Rapid Response Plan					X	X	X	X						X	X	X								
Regional Advance Mitigation Program	X	X			X	X	X	X					X	X	X	X							X	

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Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Central Valley Vision													X	X	X	X							X	
Local Agency Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities																								
County of Colusa 2030 General Plan				X									X		X								X	
Butte County Regional Conservation Plan		X			X	X	X	X					X	X	X	X							X	
Water Supply, Water Quality, and Hydropower Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP And CVP Operations (Organized Geographically from North to South)																								
Increased Hydropower Generation Capacity at Lewiston Dam																								X
Shasta Lake Water Resources Investigation	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Woodland-Davis Water Supply Project	X								X	X	X				X	X	X	X	X	X	X	X	X	X
El Dorado Water and Power Authority Supplemental Water Rights Project	X				X			X																
El Dorado Irrigation District Folsom Lake Temperature Control Device	X				X			X	X	X	X					X	X			X	X	X		
Lake Natoma Lower American River Temperature Reduction Project	X				X			X																

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Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
EBMUD Camanche Water Rights Permit Extension	X																							
EBMUD Water Supply Management Program 2040	X																							
Eastern San Joaquin Integrated Conjunctive Use Program	X			X																				
Semitropic Water Storage District Delta Wetlands	X			X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
North Bay Aqueduct Alternative Intake	X				X			X	X	X	X		X		X	X	X	X	X	X	X	X	X	X
Bay Area Regional Desalination Project	X								X	X	X				X	X	X	X	X	X	X	X	X	X
Los Vaqueros Reservoir Expansion Phase II	X						X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
South Delta Temporary Barriers Operations	X				X			X	X	X						X	X		X	X	X		X	
Stockton Deep Water Ship Channel Dissolved Oxygen Project	X				X			X																
Upper San Joaquin River Basin Storage Investigation	X		X					X	X	X	X		X		X	X	X	X	X		X	X	X	X

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Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project	X	X	X	X	X	X	X	X						X	X	X								X
FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project	X	X	X	X	X	X	X	X						X	X	X								X
Grassland Bypass Project	X						X	X	X	X	X		X		X	X	X	X	X		X	X	X	X
Central Valley RWQCB Irrigated Lands Regulatory Program	X														X									
Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS)	X														X									X
San Luis Reservoir Low Point Improvement Project	X								X	X	X					X	X	X	X		X	X	X	X
San Luis Reservoir State Recreation Area Resource Management Plan/General Plan													X	X	X	X			X			X		

Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Ecosystem Improvement Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP and CVP Operations (Organized Geographically from North to South)																								
Trinity River Restoration Program		X		X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X	X	
Clear Creek Fisheries Habitat Restoration Program				X	X	X	X	X	X	X			X	X	X	X	X							
Clear Creek Mercury Abatement and Fisheries Restoration Project	X				X	X	X	X						X		X								
Iron Mountain Mine Superfund Site	X				X			X													X			
Mainstem Sacramento River Gravel Augmentation Program		X			X			X	X	X						X	X							
Cottonwood Creek Geomorphological Analyses and Sediment Budget		X			X			X	X	X						X	X							
Cottonwood Creek Non-Native Invasive Species Eradication Program						X	X	X						X		X								
Mill Creek Riparian Assessment					X	X	X	X						X		X								

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Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project	X			X	X	X	X	X	X	X	X			X		X	X							
Yolo County Habitat/Natural Community Conservation Plan	X			X	X	X	X	X					X	X	X	X							X	
Yolo Bypass Wildlife Area Land Management Plan	X			X	X	X	X	X					X	X	X	X							X	
Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan	X			X	X	X	X	X	X	X	X		X	X	X	X	X	X			X		X	
Cache Slough Complex Restoration	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X						X	
Lower Mokelumne River Spawning Habitat Improvement Project					X			X																
North Delta Flood Control and Ecosystem Restoration Project		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Fish Screen Project at Sherman and Twitchell Islands					X				X	X	X					X	X		X		X		X	

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Table 35-1
Present and Reasonably Foreseeable Future Actions Included in the Cumulative Impacts Analysis, by Resource Area

	Surface Water Resources and Surface Water Quality	Fluvial Geomorphology and Riparian Habitat	Flood Control and Management	Groundwater Resources and Quality	Aquatic Biological Resources	Botanical Resources	Terrestrial Biological Resources	Wetlands and Other Waters of the United States	Geology, Minerals, Soils, and Paleontology	Faults and Seismicity	Cultural Resources	Indian Trust Assets	Land Use	Recreation Resources	Socioeconomics	Environmental Justice	Air Quality	Climate Change and Greenhouse Gas Emissions	Navigation, Transportation, and Traffic	Noise	Public Health and Environmental Hazards	Public Services and Utilities	Visual Resources	Power Production and Energy
Dutch Slough Tidal Marsh Restoration	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Franks Tract Project	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X		X		X	
Solano County Multi-species Habitat Conservation Plan					X	X	X	X					X	X	X	X							X	
Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
San Joaquin River Restoration Program	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X

Notes:
CALFED = CALFED Bay-Delta Program
CVP = Central Valley Project
CVPIA = Central Valley Project Improvement Act
EBMUD = East Bay Municipal Utility District
NMFS = National Marine Fisheries Service
NODOS = North-of-the-Delta Offstream Storage
RWQCB = Regional Water Quality Control Board
SWP = State Water Project
USFWS = U.S. Fish and Wildlife Service

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35.3.3 Multi-Region Projects and Actions

The multi-region projects and actions considered in this cumulative impact assessment include:

- Implementation of the CVPIA
- Implementation of CALFED Objectives
- Bay-Delta Water Quality Control Plan Update
- Bay Delta Conservation Plan
- Delta Plan
- National Marine Fisheries Service (NMFS) Public Draft Recovery Plan for Sacramento River Winter run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead
- U.S. Fish and Wildlife Service (USFWS) Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes
- Anadromous Fish Screen Program
- California Aquatic Invasive Species Rapid Response Plan
- Regional Advance Mitigation Program
- Central Valley Vision

35.3.3.1 Implementation of Central Valley Project Improvement Act

The CVPIA of 1992 amends previous authorizations of the CVP, which is one of the world's largest systems for storing and moving water, to include fish and wildlife protection and mitigation having equal priority with irrigation, domestic uses, and power generation.

Since 1993, the U.S. Bureau of Reclamation (Reclamation) and USFWS have completed several major river projects under CVPIA, including restoration of Butte Creek and installation of fish screens in the Glenn-Colusa Irrigation District and Anderson-Cottonwood Irrigation District. Overall, the CVPIA Program completed 98 actions from the river restoration plan in 26 watersheds throughout the Central Valley, focusing on removal of barriers from rivers, floodplain restoration, and riverbed gravel supplementation. Reclamation has also assisted the State of California in construction of 29 fish screen diversions. CVPIA river restoration embodies the America's Great Outdoors Initiative[1] in many respects, including expansive ecological restoration.

River restoration within the CVP is a key aspect of meeting the CVPIA fisheries goal, which is to double the natural production of anadromous fish on a sustainable basis. The current scope of the CVPIA includes 15 programs that fall into three resource areas: fisheries, refuges, and other resources. Major ongoing fishery projects include the San Joaquin River Restoration Program in central California

[1] Federal initiative based on the premise that lasting conservation solutions should come from the American people. The initiative seeks to bring a more effective approach to land management, to encourage collaboration among government agencies and private citizens to protect our outdoor legacy, to fund programs that protect land, provide assistance to communities, and improve opportunities to get young people outdoors.

(described below), the Red Bluff Fish Passage Improvement Project (recently completed), and the Trinity River Restoration Program (described below) in northern California.

35.3.3.2 Implementation of CALFED Objectives

CALFED State and federal agencies worked to develop and initiate long-term programs to achieve four interrelated objectives:

- Levee System Integrity – to reduce risks to land use, economic activities, water supply, infrastructure, and ecosystems from catastrophic levee breaches.
- Ecosystem Restoration – to improve and increase aquatic and terrestrial habitats and ecological functions in the Bay-Delta.
- Water Supply Reliability – to provide reliable Bay-Delta water supplies for projected beneficial uses dependent upon the Bay-Delta system.
- Water Quality – to provide good water quality for all beneficial uses.

The CALFED ROD was signed in 2000. Over the following seven years, many conditions occurred that had been unforeseen either in occurrence or in extent during the preparation of the CALFED Programmatic EIS/EIR. These changing conditions included a better understanding of: (1) global climate change on hydrology and sea levels, (2) potential responses to seismic events throughout California, (3) continuing land subsidence in the Bay-Delta, (4) increased populations of introduced species, especially in the Bay-Delta system, and (5) changing population growth projections. At the end of seven years (Stage 1), CALFED prepared a summary of accomplishments that had occurred during the Stage 1 period, as summarized below.

- Levee System Integrity – The Levee System Integrity Program supported programs that increased protection for, maintenance of, and stability of nearly 745 miles of Delta levees, including the reuse of 1.36 million cubic yards of dredged material for levee stability and habitat improvement; and created approximately 50 acres of riparian and wetland habitat and 3,000 feet of shaded riverine aquatic habitat.
- Ecosystem Restoration – The Ecosystem Restoration Program (ERP) supported ecosystem restoration programs upstream of the Delta in the Sacramento and San Joaquin rivers watersheds, as well as in the Delta. Restoration improvements occurred in upland, grassland, wetland, riparian, non-tidal and tidal marsh, and aquatic habitats. The initial ERP reports were completed as part of the CALFED Programmatic EIS/EIR and have been updated several times since 2000. The ERP approach is to restore or mimic ecological processes and improve aquatic and terrestrial habitats to support stable, self-sustaining populations of diverse species.

CALFED's Water Supply Reliability Program objective is achieved through five program elements, including a Storage Program Element. The Storage Program Element includes an action that provides for additional water storage, including the proposed NODOS Project and the Upper San Joaquin River Basin Storage Investigation (described below).

35.3.3.3 Bay-Delta Water Quality Control Plan Update

In accordance with the federal Clean Water Act and the Porter-Cologne Water Quality Control Act, basins plans must be developed for each hydrologic area. Each basin plan must contain water quality objectives to ensure the reasonable protection of beneficial uses, as well as a program of implementation for achieving water quality objectives. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. In California, the beneficial uses and water quality objectives form the basis of the water quality control standards. In the Bay-Delta, water quality and flow objectives to meet water quality criteria are included in the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP). The State Water Resources Control Board (SWRCB) and the Central Valley and San Francisco Regional Water Quality Control Boards (RWQCBs) are in the process of updating the Bay-Delta WQCP. The updates, or amendments, are being prepared in two phases. Initially, the SWRCB and RWQCBs are evaluating new flow objectives for the Lower San Joaquin River and the tributaries of Stanislaus, Tuolumne, and Merced rivers; and southern Delta salinity objectives. The second phase involves evaluating changes to other portions of the Bay-Delta WQCP including Delta outflows, SWP and CVP export restrictions, and other requirements in the Bay-Delta to protect fish and wildlife beneficial uses. A third phase will consider and assign responsibility for implementing measures to achieve the water quality objectives established in the first two phases.

35.3.3.4 Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is a multiple-stakeholder Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP) designed to make significant contributions to the recovery of covered species and restore a more naturally functioning Delta ecosystem while securing a reliable freshwater source from the Delta for human use. The BDCP is currently being developed through a collaboration of DWR, Reclamation, Metropolitan Water District of Southern California, Kern County Water Agency, Santa Clara Valley Water District, Zone 7 Water Agency, San Luis and Delta-Mendota Water Authority, and Westlands Water District. The BDCP includes actions to restore native fish, wildlife, and plant habitat in the Delta; modify SWP and CVP Delta water conveyance facilities and operations in the Delta; and reduce other ecological stressors that impair the function or the use of desirable habitat for ecosystem restoration or recovery in the Delta, such as physical barriers to fish migration (including levees, weirs, or gates), non-native and invasive species, and poor water quality.

The BDCP EIR/EIS was developed by DWR, Reclamation, USFWS, and NMFS. The BDCP EIR/EIS evaluates a range of alternatives that combine ecosystem restoration approaches and Delta conveyance approaches. During the last 50 years, several broad conveyance approaches have been studied to address urban water quality, water supply reliability, and environmental concerns in the Delta: physical barriers, hydraulic barriers, through-Delta facilities, and isolated facilities. Several alternative Delta conveyance facilities are being evaluated as part of the BDCP EIR/EIS. Among these alternatives are use of an isolated facility that would convey water around the Delta for local supply and export through a hydraulically isolated channel or pipeline and with continual use of the existing south Delta intakes (dual conveyance alternatives); and continuation of the use of the through-Delta conveyance with channel modifications.

35.3.3.5 Delta Plan

The Delta Stewardship Council was established by the California legislature in 2009 through the Delta Reform Act. The Delta Reform Act also required development of a legally enforceable, comprehensive, long-term management plan for the Delta, referred to as the Delta Plan. The Delta Plan will be a legally enforceable, comprehensive, long-term management plan for the Delta and the Suisun Marsh that achieves the coequal goals (Water Code section 85300(a)). Water Code section 85054 defines the coequal goals as follows:

> *Coequal goals mean the two goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place.*

The Delta Reform Act states that the policy of the State is:

> *… to achieve the following objectives as inherent in the coequal goals for the management of the Delta:*
>
> *(a) Manage the Delta's water and environmental resources and the water resources of the state over the long term.*
>
> *(b) Protect and enhance the unique cultural, recreational, and agricultural values of the California Delta as an evolving place.*
>
> *(c) Restore the Delta ecosystem, including its fisheries and wildlife, as the heart of a healthy estuary and wetland ecosystem.*
>
> *(d) Promote statewide water conservation, water use efficiency, and sustainable water use.*
>
> *(e) Improve water quality to protect human health and the environment consistent with achieving water quality objectives in the Delta.*
>
> *(f) Improve the water conveyance system and expand statewide water storage.*
>
> *(g) Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate land uses, and investments in flood protection.*
>
> *(h) Establish a new governance structure with the authority, responsibility, accountability, scientific support, and adequate and secure funding to achieve these objectives" (Water Code section 85020 et. seq.).*

The Delta Plan could address water resources projects, including improved infrastructure related to storage projects, including the proposed NODOS Project. The Delta Plan also could include recommendations related to the sustainable use of water and reduced reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency.

35.3.3.6 National Marine Fisheries Service Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead

The NMFS Draft Recovery Plan provides a roadmap that describes the steps, strategy, and actions that should be taken to return winter-run Chinook salmon, spring-run Chinook salmon, and steelhead to viable status in the Central Valley, California, thereby ensuring their long-term persistence and evolutionary potential. The general near-term strategic approach to recovery includes the following elements:

- Secure all extant populations.
- Begin collecting distribution and abundance data for *O. mykiss* in habitats accessible to anadromous fish.
- Minimize straying from hatcheries to natural spawning areas.
- Conduct critical research on fish passage above rim dams, reintroductions, and climate change.

The long-term approach to recovery includes the following elements:

- Ensure that every extant diversity group has a high probability of persistence.
- Until all ESU viability criteria have been achieved, no population should be allowed to deteriorate in its probability of persistence.
- High levels of recovery should be attempted in more populations than identified in the diversity group viability criteria because not all attempts will be successful.
- Individual populations within a diversity group should have persistence probabilities consistent with a high probability of diversity group persistence.
- Within a diversity group, the populations restored/maintained at viable status should be selected
- Allow for normative meta-population processes, including the viability of core populations, which are defined as the most productive populations.
- Allow for normative evolutionary processes, including the retention of the genetic diversity as well as an increase in genetic diversity through the addition of viable populations in historic habitats.
- Minimize susceptibility to catastrophic events.

35.3.3.7 USFWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes

The USFWS Recovery Plan addresses the recovery needs for several fish species that occupy the Delta, including delta smelt, Sacramento splittail, longfin smelt, green sturgeon, Chinook salmon (spring-run, late fall-run, and San Joaquin fall-run), and Sacramento perch (believed to be extirpated). The objective of the plan is to establish self-sustaining populations of these species that will persist indefinitely. This would be accomplished by managing the estuary to provide better habitat for aquatic life in general and for the fish addressed by the plan. Recovery actions include tasks such as increasing freshwater flows; reducing entrainment losses to water diversions; reducing the effects of dredging, contaminants, and harvest; developing additional shallow-water habitat, riparian vegetation zones, and tidal marsh; reducing effects of toxic substances from urban non-point sources; reducing the effects of introduced species; and conducting research and monitoring.

35.3.3.8 Anadromous Fish Screen Program

The primary objective of the Anadromous Fish Screen Program is to protect juvenile Chinook salmon, steelhead, green and white sturgeon, striped bass, and American shad from entrainment at priority diversions throughout the Central Valley. Section 3406 (b)(21) of the CVPIA requires the Secretary of the Interior to assist the State of California in developing and implementing measures to avoid losses of juvenile anadromous fish resulting from unscreened or inadequately screened diversions on the Sacramento and San Joaquin rivers, their tributaries, the Delta, and the Suisun Marsh.

35.3.3.9 California Aquatic Invasive Species Rapid Response Plan

The California Department of Fish and Wildlife[2] (CDFW) released the final California Aquatic Invasive Species Management Plan in January 2008. As part of this plan, the Aquatic Invasive Species Rapid Response Plan is proposed for the State of California. The Rapid Response Plan establishes a draft general procedure for rapid response following detection of new aquatic invasive species infestation. It provides a framework for developing and implementing a rapid response plan. It is preliminary in that it describes types of information, resources and decisions necessary to finalize the plan. In order to finalize, fund, and implement the draft Rapid Response Plan, CDFW expects that cooperating agencies will assign staff to participate. CDFW Invasive Species Program staff will provide coordination for the interagency activities called for in the agreement(s).

35.3.3.10 Giant Garter Snake Recovery Plan

The Draft Giant Garter Snake Recovery Plan was published by USFWS in 1999, but a final plan was not published. However, USFWS continues to implement the recovery plan with a 5-year analysis that considers threats, conservation measures, and regulatory mechanisms.

The giant garter snake inhabits wetland habitats within the Central Valley. Loss and fragmentation of wetland habitats have extirpated the giant garter snake from the majority of its historic range. The recovery plan also considers several species of concern that occur in Central Valley wetlands that benefit from actions taken to recover the giant garter snake. These species include the tricolored blackbird, white-faced ibis, western pond turtle, and associated waterfowl.

The ultimate goal of the recovery plan is to delist the giant garter snake. Recovery criteria for the giant garter snake are defined for four recovery units in the Central Valley: the Sacramento Valley, Mid-Valley, San Joaquin Valley, and South Valley units. Recovery criteria include:

a) Monitoring shows that in 17 out of 20 years, 90 percent of the subpopulations in four recovery units contain both adults and young.

b) All extant populations within the recovery unit are protected from threats that limit populations.

c) Supporting habitat within the recovery unit is adaptively managed and monitored.

d) Subpopulations are well connected by corridors of suitable habitat.

e) Repatriation (reintroduction) has been successful at a specified number of suitable sites

[2] Formerly known as the California Department of Fish and Game (i.e., prior to January 1, 2013).

Necessary actions described in the plan include protecting existing populations and habitat; restoring populations to former habitat; surveying to determine species distributions; monitoring populations; conducting necessary research, including studies on demographics, population genetics, and habitat use; and developing and implementing incentive programs, and an outreach and education plan.

35.3.3.11 Regional Advance Mitigation Program

The Regional Advance Mitigation Program (RAMP) attempts to provide a method to achieve faster, less expensive, and better mitigation for unavoidable impacts associated with infrastructure projects on a landscape scale rather than by project-by-project mitigation. RAMP Work Group participants include federal and State agencies (including DWR, CDFW, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers (USACE), and California Department of Transportation [Caltrans]).

The basic RAMP concept is twofold. First, it establishes a regional framework for identifying existing and potential mitigation approaches in a geographically specific portion of the State that could support the needs of planned infrastructure projects and meet the needs of regulatory agencies. Second, it identifies which mitigation approaches could best create habitat in advance of potential unavoidable impacts of infrastructure projects. Working together, natural resource and infrastructure funding agencies can estimate mitigation needs early in the projects' timelines, avoiding permitting and regulatory delays and allowing public mitigation dollars to stretch further by securing and conserving valuable natural resources.

DWR and Caltrans are leading development of the RAMP initiative using bond funding, but will actively seek additional voluntary partners as the structure for long-term funding and governance is more clearly defined. RAMP does not supply permits for infrastructure projects; rather, its purpose is to provide a more efficient and cost-effective option for supplying mitigation within existing permitting processes. Infrastructure agencies will individually apply for their permits to perform actions. Within the application materials, they could reference an advance mitigation site created through RAMP. These sites may be authorized by the resource agencies using the same methodology as a private commercial mitigation bank and other agencies, or authorized using alternative methods supported by these same agencies. The RAMP Work Group developed a Draft Statewide Framework for Regional Advance Mitigation Planning in California intended to convey to lawmakers and agency leaders the goals, benefits, and operational framework of a statewide RAMP initiative.

35.3.3.12 Central Valley Vision

In 2003, the California Department of Parks and Recreation (State Parks) began work on a long-term Central Valley Vision to develop a strategic plan for State Parks expansion in the Central Valley. The plan will provide a 20-year road map for State Parks actions to focus on increasing service to Valley residents and visitors. Within the Great Central Valley (San Joaquin Valley, Sacramento Valley and the Delta region), State Parks operates and maintains 32 State park units representing seven percent of the total State park system acreage. The 2009 Central Valley Vision Implementation Plan proposed 11 new parks in the Central Valley and several park expansion projects. Several of the new and expanded parks are/would be located near the proposed NODOS Project facilities, including:

- Proposed Anderson-Sacramento River Park (approximately 225 acres along the Sacramento River with campsites, picnic sites, trails, fishing and boating access, and interpretative services)
- Proposed Big Bend Park (approximately 2,000 acres along the Sacramento River with campsites, picnic sites, trails, fishing and boating access, and interpretative services)

- Expand Woodson Bridge State Recreation Area (add a 700-acre parcel along Kopta Slough and restore 180-acres of habitat)
- Expand Colusa-Sacramento River State Recreation Area (add 13 acres and restore 140 acres of habitat; and add campsites, picnic sites, fishing and boating access, and interpretative services)
- Expand State Park at Sutter Buttes (acquire approximately 1,000 acres and add campsites, picnic sites, trails, and interpretative services)
- Proposed Sacramento River Boating Trail (from Redding to Sacramento with boat-in campsites and day use areas at existing parks and marinas, and interpretative services)

Other new and expanded parks are/would be located near SWP and CVP facilities, including:

- Expand campsites, picnic sites, trails, and boating facilities at Lake Oroville State Recreation Area.
- Expand track, picnic, and day use facilities at Clay Pit State Vehicular Recreation Area
- Proposed Sacramento and Feather River Boating Trail (from Redding to Sacramento and Oroville to Sacramento with boat-in campsites and day use areas and interpretative services)
- Proposed Elkhorn Basin (approximately 1,500 acres along Sacramento River near confluence with Feather River)
- Improve Folsom Lake State Recreation Area and Folsom Powerhouse State Historic Park (add campsites, picnic sites, fishing and boating access, and interpretative services; and add trails to connect to Deer Creek Hills Preserve)
- Proposed Sacramento River Boating Trail (from Sacramento through the Delta)
- Expand Delta Meadows California State Parks property (acquire approximately 230 acres; and add campsites, picnic sites, fishing and boating access, and interpretative services)
- Proposed Barker Slough Park (near the North Bay Aqueduct Pumping Plant – transfer approximately 500 acres from DFW to California State Parks; restore habitat; and add picnic sites, boating access, and interpretative services)
- Expanded Caswell Memorial State Park (acquire approximately 200 acres; restore a portion for habitat; and add campsites, picnic sites, trails, and interpretative services)
- Proposed San Joaquin River Parkway (approximately 1,250 acres of public land along the San Joaquin River; and add campsites, picnic sites, trails, boating access, and interpretative services)

The Central Valley Vision also recommended development of several heritage corridors, including:

- California Delta Heritage Corridor (to connect Delta towns, recreation sites, nature areas, and agricultural sites)
- Cross-California Ecological Corridor (to connect recreation lands such as Sutter National Wildlife Refuge and South Yuba River State Park with natural areas)
- Central Valley Farm Trails Heritage Corridor (to connect agricultural sites, communities, historic sites, and water facilities along the State Highway 99 and Interstate 5 corridors in the Central Valley)

- Echoes of Our Ancestors Heritage Corridor (to connect areas that are representative of California's ethnic diversity in the Central Valley)

35.3.4 Local Agency Projects and Actions in the Vicinity of North-of-the-Delta Offstream Storage Project Facilities

The local agency projects and actions in the vicinity of the proposed NODOS Project facilities considered in this cumulative impact assessment include:

- Colusa County General Plan Update
- Butte County Habitat Conservation Plan

35.3.4.1 Colusa County 2030 General Plan

The County of Colusa 2030 General Plan, adopted on July 31, 2012, supersedes and replaces the County's 1989 General Plan. The 2030 General Plan carries forward much of the major goal and policy framework of the 1989 General Plan, but has been reorganized to make the document more user-friendly. The Plan identifies the County's vision for the future and provides a framework that will guide decisions on growth, development, and conservation of open space and resources in a manner consistent with the quality of life desired by the County's residents and businesses.

35.3.4.2 Butte County Regional Conservation Plan

The Butte Regional Conservation Plan (BRCP) is being coordinated by the Butte County Association of Governments (BCAG) on behalf of Butte County; cities of Chico, Oroville, Gridley, and Biggs; Western Canal Water District, the Richvale Irrigation District, the Biggs West-Gridley Water District, Butte Water District, and Caltrans. The BRCP is both a federal Habitat Conservation Plan (HCP) and a state Natural Community Conservation Plan (NCCP). It is a voluntary plan that will provide streamlined endangered species act permitting for transportation projects, land development and other covered activities over the 30-50 year term of the permits. It will also provide comprehensive species, wetlands and ecosystem conservation and contribute to the recovery of endangered species within the Plan Area. The BRCP will:

- Reduce the cost and increase the consistency of the State and federal permitting process;
- Provide certainty of regulatory costs and requirements;
- Provide local control by consolidating and streamlining environmental permitting under one locally controlled plan;
- Provide improved habitat preserves for species; and
- Protect the right of private property owners- conservation land acquisition will be through willing sellers only.

The first administrative draft of the BRCP was prepared in June 2011. A preliminary public draft was released in November 2012. The scoping process was initiated on December 14, 2012 with the publication of the Notice of Preparation of an EIS/EIR for the plan. The project is scheduled to be completed in 2013.

35.3.5 Water Supply, Water Quality, and Hydropower Projects and Actions in the Vicinity of the Proposed NODOS Project Facilities and/or Potentially Affected by SWP and CVP Operations (organized geographically from north to south)

The water supply, water quality, and hydropower projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations considered in this cumulative impact assessment include:

- Increased Hydropower Generation Capacity at Lewiston Dam
- Shasta Lake Water Resources Investigation
- Woodland-Davis Water Supply Project
- El Dorado Water and Power Authority Supplemental Water Rights Project
- El Dorado Irrigation District Folsom Lake Temperature Control Device
- Lake Natoma Lower American River Temperature Reduction Project
- EBMUD Camanche Water Rights Permit Extension
- EBMUD Water Supply Management Program 2040
- Eastern San Joaquin Integrated Conjunctive Use Program
- Semitropic Water Storage District Delta Wetlands
- North Bay Aqueduct Alternative Intake
- Bay Area Regional Desalination Project
- Los Vaqueros Reservoir Expansion Phase II
- South Delta Temporary Barriers Operations
- Stockton Deep Water Ship Channel Dissolved Oxygen Project
- Upper San Joaquin River Basin Storage Investigation
- FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project
- FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project
- Grassland Bypass Project
- Central Valley RWQCB Irrigated Lands Regulatory Program
- Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS)
- San Luis Reservoir Low Point Improvement Project
- San Luis Reservoir State Recreation Area Resource Management Plan/General Plan

35.3.5.1 Increased Hydropower Generation Capacity at Lewiston Dam

The Trinity Public Utilities District (TPUD) and Reclamation intend to increase the power generating capacity at the Lewiston Dam, located near Weaverville, California, from the existing 350 kilowatts to approximately 2.2 megawatts. This upgrade will not only allow for better control of the flow from the dam to the Trinity River, but also provide an increase in revenue from power generation. Power generated by this project could be available for CVP water facilities operations, preference power customers served by Western Area Power Administration, or local electricity users served by TPUD.

35.3.5.2 Shasta Lake Water Resources Investigation

The Shasta Lake Water Resources Investigation is currently being conducted by Reclamation to determine the type and extent of federal interest in a multiple purpose plan to modify Shasta Dam and Reservoir to increase the survival of anadromous fish populations in the upper Sacramento River and increase water supplies and water supply reliability for agricultural, municipal, industrial, and environmental purposes. To the extent possible through meeting these objectives, alternatives include features to benefit other identified water and related resource needs including ecosystem conservation and enhancement, improved hydropower generation capability, flood damage reduction, increased recreation opportunities, and improved water quality conditions in the Sacramento River and the Delta consistent with CALFED objectives. Anticipated alternatives for expansion of Shasta Lake include, among other features, raising the dam from 6.5 to 18.5 feet above current elevation, which would result in additional storage capacity of 256,000 to 634,000 acre-feet, respectively. The increased capacity is expected to improve water supply reliability and increase the cold water pool, which would provide improved water temperature conditions for anadromous fish in the Sacramento River downstream of the dam.

35.3.5.3 Woodland-Davis Water Supply Project

The Woodland-Davis Water Supply Project has been proposed by the Woodland Davis Clean Water Agency for the cities of Davis and Woodland, and the University of California, Davis (UCD). The project would divert up to approximately 45,000 acre-feet per year of surface water from the Sacramento River and convey it for treatment and subsequent use in Davis, Woodland, and on the UCD campus. The purpose of the project is to provide a reliable water supply to meet existing and future needs, improve water quality for drinking supply purposes, and improve treated wastewater effluent quality through 2040. Project activities would include construction and operation of a water intake/diversion, conveyance, and water treatment facilities. Surface water supplies would be acquired through new water rights and water rights transfers from senior water rights holders.

The project would be located in the east-central portion of Yolo County, between and within the cities of Woodland and Davis, the UCD campus, and west of the Sacramento River. The new water diversion facility would be constructed on the Sacramento River near the Interstate 5 crossing at the location of the existing Reclamation District 2035 diversion. The water treatment plant to treat the surface water diverted from the Sacramento River would have an ultimate capacity of up to 64 millions of gallons per day.

Project water diversions would be made in compliance with Standard Water Right Permit Term 91, which prohibits surface water diversions when water is being released from CVP or SWP storage reservoirs to meet in-basin entitlements, including water quality and environmental standards for protection of the Delta. Water supply needs during periods applicable to Term 91 would be satisfied by entering into water supply transfer agreements with senior water rights holders within the Sacramento River watershed.

35.3.5.4 El Dorado Water and Power Authority Supplemental Water Rights Project

The El Dorado Water and Power Authority (EDWPA) proposes to establish permitted water rights allowing diversion of water from the American River basin to meet planned future water demands in the El Dorado Irrigation District (EID) and Georgetown Divide Public Utility District (GDPUD) service areas, and other areas located within El Dorado County that are outside of these service areas. EDWPA will be filing with the State Water Resources Control Board, Division of Water Rights, petitions for partial assignment of each of State Filed Applications 5644 and 5645, and accompanying applications allowing for the total withdrawal for use of 40,000 acre-feet per year, consistent with the diversion and storage locations allowed under the El Dorado-Sacramento Municipal Utility District (SMUD) Cooperation Agreement.

35.3.5.5 El Dorado Irrigation District Folsom Lake Temperature Control Device

The El Dorado Irrigation District (EID), in collaboration with Reclamation, proposes to construct facilities on the bank of Folsom Lake to withdraw water from the warm upper reaches of the lake while preserving the cold water pool at the bottom of the lake to protect downstream aquatic species. The facilities will include a large diameter concrete-lined vertical shaft and five lined horizontal adits extending from the shaft. This structure, known as a Temperature Control Device (TCD), will replace the District's five existing raw pump casings that currently extract water from Folsom Lake. The new facility will be sized to accommodate over twice the current capacity.

35.3.5.6 Lake Natoma Lower American River Temperature Reduction Project (Formerly the Lake Natoma Temperature Curtains Pilot Project)

The USFWS, Reclamation, and Sacramento Water Forum are proposing the Lower American River Temperature Reduction Modeling Project. The objective of the project is to develop predictive tools that will: 1) Reduce uncertainties in the performance of identified temperature control actions that could be implemented to improve the management of cold water resources in the Folsom/Natoma reservoir system and the lower American River, and 2) Be available for daily operations, planning, and salmon and steelhead habitat studies by other project operators and other stakeholders.

The project adapted, calibrated, and verified existing thermodynamic and hydrologic mathematical models for application at Folsom Reservoir, Lake Natoma and the lower American River. The models were used to assess the effectiveness of the identified actions individually and in combination and develop a recommendation for development and implementation of one or more actions for the purpose of reducing temperatures in the lower American River. The actions identified to improve transport of cold water through Lake Natoma and reduce the temperature of the lower American River included: a Nimbus Dam curtain, a Lake Natoma plunge zone curtain, Nimbus powerplant debris wall removal, dredging Lake Natoma, and modifying Folsom Powerplant peak loading operation.

35.3.5.7 EBMUD Camanche Water Rights Permit Extension

The Camanche Permit Extension would extend the term of the existing East Bay Municipal Utility District's (EBMUD) Camanche water right Permit 10478 through the year 2040 to divert water from the Mokelumne River for use in the EBMUD service area. Extending the Camanche Permit would allow EBMUD additional time to apply the water provided under Permit 10478 to municipal and industrial use within EBMUD's designated service area. Additionally, EBMUD has submitted documentation that describes that the full entitlement of Permit 10478 through 2040 is needed to maintain operational flexibility to meet future projected water demand and address system vulnerabilities associated with several factors, including emergencies and potential effects of climate change.

35.3.5.8 EBMUD Water Supply Management Program 2040

EBMUD's current Water Supply Management Program (WSMP 2020), adopted in 1993, serves as the basis for water conservation and recycling programs and for development of supplemental supply initiatives such as the Freeport Regional Water Project. The WSMP 2040 updates the current plan and extends the planning horizon another 20 years. It identifies and recommends a Preferred Portfolio of solutions to meet dry-year water needs through 2040, including desalination and enlargement of Mokelumne River reservoirs.

The primary objectives of the WSMP 2040 are to maintain and improve EBMUD's water supply reliability to its customers and help meet the need for water in the future. WSMP 2040 will also adapt the EBMUD's water planning approach to circumstances that have changed since WSMP 2020 was adopted, such as competing and changing demands for water, the availability of Freeport water after 2009, and long-term climate change. EBMUD adopted the Revised WSMP 2040 Final Plan in April 2012.

35.3.5.9 Eastern San Joaquin Integrated Conjunctive Use Program

The purpose of the Integrated Conjunctive Use Program is to develop approximately 140,000 to 160,000 acre-feet per year of new surface water supply for the Eastern San Joaquin Basin that will be used to directly and indirectly support conjunctive use by the Northeastern San Joaquin County Groundwater Banking Authority (GBA) member agencies. This amount of water would support groundwater recharge at a level consistent with the GBA's objectives for conjunctive use and the underlying groundwater basin. Within this framework, the program would implement the following categories of conjunctive use projects and actions:

- Water conservation measures
- Water recycling
- Groundwater banking
- Water transfers
- Development of surface storage facilities
- Groundwater recharge
- River withdrawals
- Construction of pipelines and other facilities

To enable and facilitate sustainable and reliable management of San Joaquin County's water resources, the GBA developed a series of Basin Management Objectives to support conjunctive use and address a variety of water resources issues, including groundwater overdraft, saline groundwater intrusion, degradation of groundwater quality, environmental quality, land subsidence, supply reliability, water demand, urban growth, recreation, agriculture, flood protection, and other issues. The purpose of the Basin Management Objectives is to ensure the long-term sustainability of water resources in the San Joaquin Region.

35.3.5.10 Semitropic Water Storage District Delta Wetlands

In 1987, Delta Wetlands, a California Corporation, proposed a project for water storage and wildlife habitat enhancement on four privately owned islands in the Delta. The four islands were Bacon Island and Bouldin Island in San Joaquin County, and Holland Tract and Webb Tract in Contra Costa County, encompassing approximately 23,000 acres. The Delta Wetlands Project would store water on two Reservoir Islands (Bacon Island and Webb Tract) for subsequent release into the Delta, and habitat enhancement to compensate for wetland and wildlife effects of the water storage operations with a Habitat Management Plan (HMP) on two Habitat Islands (Bouldin Island and Holland Tract).

In 2007, the Delta Wetlands Project partnered with the Semitropic Water Storage District (Semitropic WSD) to: 1) provide water to Semitropic WSD to augment its water supply, and bank water within the Semitropic Groundwater Storage Bank and Antelope Valley Water Bank. The designated places of use for Delta Wetlands Project water would include: Semitropic Water Storage District; Member Agencies of the Metropolitan Water District of Southern California, the Western Municipal Water District of Riverside County, and select service areas of the Golden State Water Company. The project would include improvements of 27 miles of levees and screened diversions to divert water during high-flow periods in the winter months of December through March into Webb Tract (100,000 acre-feet of storage) and Bacon Island (115,000 acre-feet of storage). The water would not be diverted in a manner that would adversely affect senior legal water rights holders, including the SWP and CVP. Stored water would be discharged into False River (from Webb Tract) and Middle River (from Bacon Island) for export when excess SWP or CVP diversion capacity is available, in the summer and fall months of July through November. Any water that could not be exported from the Delta in a given year would be available to increase Delta outflow in the fall months of September through November. Semitropic WSD issued a Draft EIR in 2010 and a Final EIR in 2011.

35.3.5.11 North Bay Aqueduct Alternative Intake

DWR issued a Notice of Preparation on December 2, 2009 to construct and operate an alternative intake on the Sacramento River, generally upstream of the Sacramento Regional Wastewater Treatment Plant, and connect it to the existing North Bay Aqueduct system by a new segment of pipe. The proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct intake at Barker Slough. The proposed project would be designed to improve water quality and to provide reliable deliveries of State Water Project supplies to its contractors, the Solano County Water Agency, and the Napa County Flood Control and Water Conservation District.

35.3.5.12 Bay Area Regional Desalination Project

The Bay Area's four largest water agencies (EBMUD, Contra Costa Water District (CCWD), Santa Clara Valley Water District, and the San Francisco Public Utility Commission) are jointly exploring the development of regional desalination facilities that would benefit Bay Area residents and businesses served by these agencies. The Bay Area Regional Desalination Project could consist of one or more desalination facilities, with an ultimate total capacity of up to 71 million gallons per day. The project would provide an additional source of water during emergencies, such as earthquakes or levee failures, increase supply reliability, and provide water during droughts or maintenance of other facilities. A pilot plant was constructed at Mallard Slough. The water agencies are reviewing the results of the pilot study.

35.3.5.13 Los Vaqueros Reservoir Expansion Phase II

Los Vaqueros Reservoir is an off-stream reservoir in the Kellogg Creek watershed to the west of the Delta. The Los Vaqueros Reservoir initial construction was completed in 1997 as a 100,000 acre-foot off-stream storage reservoir owned and operated by CCWD to improve delivered water quality and emergency storage reliability for CCWD's customers. In 2012, the Los Vaqueros Reservoir was expanded to a total storage capacity of 160,000 acre-feet (Phase 1) to provide additional water quality and supply reliability benefits, and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment. As part of the Storage Investigation Program described in the CALFED ROD, additional expansion up to 275,000 acre-feet (Phase 2) is being evaluated by CCWD, DWR, and Reclamation. The alternatives considered in the evaluation also consider methods to convey water from Los Vaqueros Reservoir to the South Bay Aqueduct to provide water to Zone 7 Water Agency, Alameda County Water District, and Santa Clara Valley Water District.

35.3.5.14 South Delta Temporary Barriers Operations

The South Delta Temporary Barriers Project was initiated as a test project in 1991. The South Delta Temporary Barriers Project consists of three rock barriers and one non-physical barrier across South Delta channels to increase water levels, improve water circulation patterns and water quality in the southern Delta for local agricultural diversions, and improve operational flexibility of the SWP to help reduce fishery impacts and improve fishery conditions. The barriers have been installed at the Head of Old River (HOR), Middle River, Old River near Tracy, and Grantline Canal. Installation of the barriers is dependent upon flow conditions, presence of specific fish species in the South Delta near water intakes, requirements of water users, and regulatory requirements of CDFW, USFWS, NMFS, and USACE. The barrier at the HOR serves as a fish barrier (intended to primarily benefit migrating San Joaquin River Chinook salmon) and is installed and operated in April-May and again in September-November. The remaining three barriers (Old River at Tracy, Grant Line Canal, Middle River) serve as agricultural barriers (intended to primarily benefit agricultural water users in the south Delta) and are installed and operated between April 15 and November 30 of each season. In 2008, a court order designed to protect delta smelt prohibited the installation of the spring HOR barrier pending fishery agency actions or further order of the court. The remaining three barriers serve as agricultural barriers and are installed between April 15 and September 30 of each season. An experimental underwater, non-physical barrier was installed near the HOR in 2009.

35.3.5.15 Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project

The Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project is a multiple-year study of the effectiveness of elevating dissolved oxygen (DO) concentrations in the channel. DO concentrations drop as low as two to three milligrams per liter (mg/L) during warmer and lower water flow periods in the San Joaquin River. The low DO levels can adversely affect aquatic life including the health and migration behavior of anadromous fish (e.g., salmon). The objective of the study is to maintain DO levels above the minimum recommended levels specified in the State of California WQCP (Basin Plan) for the Sacramento River and San Joaquin River basins. The Basin Plan water quality objectives for DO are 6.0 mg/l in the San Joaquin River (between Turner Cut and Stockton, 1 September through 30 November) and 5.0 mg/l the remainder of the year.

The project's full-scale aeration system includes two 200-foot-deep u-tube aeration tubes; two vertical turbine pumps capable of pumping over 11,000 gallons of water each; a liquid-to-gas oxygen supply system; and numerous pieces of ancillary equipment and control systems. The system has been sized to deliver approximately 10,000 pounds of oxygen per day into the Deep Water Ship Channel. The aeration system is anticipated to be operated only when channel DO levels are below the Basin Plan DO water quality objectives (approximately 100 days per year). The project includes an on-going assessment of DO levels in the channel and vicinity and a study of potential adverse effects of low DO on salmon.

35.3.5.16 Upper San Joaquin River Basin Storage Investigation (Previously described as Temperance Flat Reservoir)

The Upper San Joaquin River Basin Storage Investigation is being conducted by Reclamation and DWR to evaluate alternative plans to increase Upper San Joaquin River Storage to enhance the San Joaquin River restoration efforts and improve water supply reliability for agricultural, municipal and industrial, and environmental uses in the Friant Division, the San Joaquin Valley, and other regions of the state. The investigation will also evaluate integration of conjunctive management and water transfer concepts into project formulations. Additional storage is also expected to provide incidental flood damage reduction benefits.

Reclamation is analyzing alternatives for a new dam and a 1.26 million acre-foot reservoir at San Joaquin River Mile 274, in an area known as Temperance Flat. Primary planning objectives are to: 1) increase water supply reliability, and 2) enhance flow and temperature conditions to support the San Joaquin River Restoration Program. To the extent possible, the investigation will explore opportunities to provide other benefits that could include hydropower, flood control, and recreation. Operation variables include reservoir carryover, new or shifting water supply beneficiaries, and alternative conveyance routes. Operations alternatives evaluated in the draft Feasibility Report will be selected from combinations that most economically accomplish the planning objectives.

35.3.5.17 FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project

The Don Pedro Project is located on the Tuolumne River in Tuolumne County. The initial license was issued for operations between 1971 and 1991 followed by requirements to evaluate fisheries water needs in the Tuolumne River. In 1987, after the Turlock Irrigation District and Modesto Irrigation District applied to amend their license to add a fourth generating unit, FERC approved an amended fish study plan with possible changes in 1998. In 1996, FERC amended the license to implement amended minimum flow criteria and require fish monitoring studies for completion in 2005. In 2002, NMFS requested that FERC initiate formal consultation on the effects of the Don Pedro Project on Central Valley steelhead that were listed as threatened in 1998. FERC approved the Summary Report on fisheries in 2008. In 2009, NMFS, USFWS, CDFW, and several environmental interest groups filed requests for rehearing on the license. FERC denied portions of the request but required instream flow studies to be conducted and required NMFS to be included for consultation on any authorized changes to minimum flow release schedules. FERC also directed the appointment of an administrative law judge to assist in assessing the need for and feasibility for interim measures prior to relicensing. A final report was completed in 2010. Following the completion of the report and a monitoring plan by the affected districts, FERC approved an order modifying and approving instream flow and monitoring study plans. The initial license will expire in 2016. The objective of the relicensing process is to continue operation and maintenance of the Don Pedro Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license. The FERC relicensing procedures include an Endangered Species Act consultation by USFWS and NMFS.

35.3.5.18 FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project

The Merced River Hydroelectric Project is located on the Merced River in Mariposa County and includes both Lake McClure and McSwain Reservoir, two powerhouses (New Exchequer and McSwain), and recreation facilities. The initial FERC license will expire on February 28, 2014. The objective of the relicensing process is to continue operation and maintenance of the Merced River Hydroelectric Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license. The FERC relicensing procedures include an Endangered Species Act consultation by USFWS and NMFS.

35.3.5.19 Grassland Bypass Project

The purposes and objectives of the proposed continuation of the Grassland Bypass Project, 2010–2019 are to: 1) extend the San Luis Drain Use Agreement in order to allow the Grassland Basin Drainers time to acquire funds and develop feasible drainwater treatment technology to meet revised Basin Plan objectives (amendment underway) and Waste Discharge Requirements by December 31, 2019; 2) continue the separation of unusable agricultural drainage water discharged from the Grassland Drainage Area from wetland water supply conveyance channels for the period 2010–2019; and 3) facilitate drainage management that maintains the viability of agriculture in the Project Area and promotes continuous improvement in water quality in the San Joaquin River. All discharges of drainage water from the Grassland Drainage Area into wetlands and refuges have been eliminated. The selenium load discharged from the Grassland Drainage Area has been reduced by 61 percent (from 9,600 lbs to 3,700 lbs) and the salt load has been reduced by 39 percent (from 187,300 tons to 113,600 tons). Prior to the project, the monthly mean concentration of selenium in Salt Slough was 16 parts per billion. Since October 1996, the concentration has been less than the water quality objective of two parts per billion. The drainage water is conveyed to Mud Slough. Grasslands Water District and others are currently evaluating alternative plans to comply with Central Valley RWQCB water quality objectives for selenium and salinity in the San Joaquin River at the end of this project in 2019. One of the alternatives could be zero discharge with complete recycle of the drainwater to salinity-tolerant crops.

35.3.5.20 Central Valley RWQCB Irrigated Lands Regulatory Program

The Irrigated Lands Regulatory Program regulates discharges from irrigated agricultural lands. Its purpose is to prevent agricultural discharges from impairing the waters that receive the discharges. The California Water Code authorizes the SWRCB and RWQCBs to conditionally waive waste discharge requirements if this is in the public interest. On this basis, the Los Angeles, Central Coast, Central Valley, and San Diego RWQCBs have issued conditional waivers of waste discharge requirements to growers that contain conditions requiring water quality monitoring of receiving waters. In 2010, the Central Valley RWQCB proposed to expand the requirements to groundwater especially for regulation of discharges with higher concentrations of nutrients. Participation in the waiver program is voluntary; however, non-participant dischargers must file a permit application as an individual discharger, stop discharging, or apply for coverage by joining an established coalition group. The waivers must include corrective actions when impairments are found.

35.3.5.21 Central Valley Salinity Alternatives for Long-term Sustainability

In 2006, the Central Valley RWQCB, the SWRCB, and stakeholders began a joint effort to address salinity and nitrate problems in California’s Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. This effort is referred to as the Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS) Initiative. The goal of CV-SALTS is to develop a comprehensive region-wide Salt and Nitrate Management Plan (SNMP) describing a water quality protection strategy that will be implemented through a mix of voluntary and regulatory efforts. The SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions. The SNMP will serve as the basis for amendments to the three Basin Plans that cover the Central Valley Region (Sacramento River and San Joaquin River Basin Plan, the Tulare Lake Basin Plan, and the Sacramento/San Joaquin Rivers Bay-Delta Plan). The basin plan "amendments" will likely establish a comprehensive implementation plan to achieve water quality objectives for salinity (including nitrate) in the Region's surface waters and groundwater; and the SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions.

35.3.5.22 San Luis Reservoir Low Point Improvement Project

The San Luis Reservoir Low Point Improvement Project is proposed by Reclamation, the Santa Clara Valley Water District, and the San Luis and Delta Mendota Water Authority. As part of this project, Reclamation is investigating three alternatives to address the water quality problems within the CVP's San Felipe Division (Santa Clara and San Benito counties) that arise when San Luis Reservoir levels drop below 300,000 acre-feet during late summer in dry water years, resulting in large algal blooms. The alternatives being considered are to (1) expand the 6,000 acre-feet Pacheco Reservoir to 80,000 acre-feet or 130,000 acre-feet, (2) lower the San Felipe Intake at San Luis Reservoir, or (3) implement a combination comprehensive plan. The combination comprehensive plan would involve increasing groundwater recharge and recovery capacity, implementing desalination measures, re-operating Santa Clara Valley Water District's raw- and treated-water systems, and implementing institutional measures. If Pacheco Reservoir were to be enlarged, the reservoir would be filled with Delta water; thus, additional impacts on Delta aquatic species (e.g., juvenile salmonids and delta smelt) could result from an increase in Delta exports. The environmental scoping report for the San Luis Reservoir Low Point Improvement Project was released in January 2009 and the plan formulation report was published in January 2011.

35.3.5.23 San Luis Reservoir State Recreation Area Resource Management Plan/General Plan

The Resource Management Plan/General Plan for San Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir are being developed. State Parks manages the San Luis Reservoir State Recreation Area. Lands have been identified at O'Neill Forebay Wildife Area and San Luis Wildlife Area by Reclamation for management by CDFW. The Resource Management Plan/General Plan EIS/EIR evaluated three alternatives plus the No Action Alternative. One alternative would limit new access and development of the recreation areas. A second alternative would have moderate new access and recreation development. The third alternative would have the most new access and recreation development. The Revised Draft EIS/EIR was issued by Reclamation and State Parks in August 2012.

35.3.6 Ecosystem Improvement Projects and Actions in the Vicinity of Proposed NODOS Project facilities and/or Potentially Affected by SWP and CVP Operations (organized geographically from north to south)

The ecosystem improvement projects and actions in the vicinity of the proposed NODOS Project facilities and/or potentially affected by SWP and CVP operations considered in this cumulative impact assessment include:

- Trinity River Restoration Program
- Clear Creek Fisheries Habitat Restoration Program
- Clear Creek Mercury Abatement and Fisheries Restoration Project
- Iron Mountain Mine Superfund Site (on Spring Creek)

- Mainstem Sacramento River Gravel Augmentation Program
- Cottonwood Creek Geomorphological Analyses and Sediment Budget
- Cottonwood Creek Non-Native Invasive Species Eradication Program
- Mill Creek Riparian Assessment
- Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project
- Yolo County Habitat/Natural Community Conservation Plan
- Yolo Bypass Wildlife Area Land Management Plan
- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan
- Cache Slough Complex Restoration
- Lower Mokelumne River Spawning Habitat Improvement Project
- North Delta Flood Control and Ecosystem Restoration Project
- Fish Screen Project at Sherman and Twitchell Islands
- Dutch Slough Tidal Marsh Restoration
- Franks Tract Project
- Solano County Multi-species Habitat Conservation Plan
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation
- San Joaquin River Restoration Program

35.3.6.1 Trinity River Restoration Program

Trinity River Restoration Program is conducted by eight partners that form the Trinity Management Council, including Reclamation, USFWS, NMFS, U.S. Forest Service, Hoopa Valley Tribe, Yurok Tribe, California Resources Agency, and Trinity County. The Trinity River Flow Evaluation Final Report was adopted in 1999 and the Trinity River Record of Decision (ROD) was signed in 2000 to implement restoration of the physical processes and rescale the Trinity River as foundation for fisheries recovery. The ROD described four restoration methods (flow management through releases from Lewiston Dam, construction of channel rehabilitation sites, augmentation of spawning gravels, and control of fine sediments); infrastructure improvements to accommodate high flow releases from Lewiston Dam; environmental compliance with improvements to riparian vegetation and wetlands, reduced turbidity, and improved water temperatures; and science-based adaptive management. The Trinity River Restoration Program 2011 Annual Report stated that approximately half of the projects described in the Flow Evaluation Study had been completed and intensive assessments of the physical responses of the Trinity River and geomorphic assessments of the 40-mile restoration reach had been initiated.

35.3.6.2 Clear Creek Fisheries Habitat Restoration Program

The Clear Creek fisheries habitat restoration is being implemented by USFWS and Reclamation in accordance with CVPIA actions (3406(b)(12). The restoration project’s purpose is to support spring-run, fall-run, and late-fall-run Chinook salmon and steelhead, including improved flows for spawning, incubation, rearing, and outmigration; instream flow studies; removal of McCormick-Saeltzer Dam, improved fish passage, reduction in channel erosion, channel and floodplain restoration, gravel augmentation, and adaptive management with monitoring programs.

The Clear Creek Gravel Augmentation Program is part of the CVPIA actions to reduce impacts created by the construction and operation of Whiskeytown Dam. Whiskeytown Dam blocks gravel from moving downstream into the areas of Clear Creek where salmonids spawn. The injection of spawning-sized gravel will maintain quality spawning habitat for the production of salmonids. By the year 2020 the overall goal is to provide 347,288 square feet of usable spawning habitat between Whiskeytown Dam downstream to the former McCormick-Saeltzer Dam, the amount that existed before construction of Whiskeytown Dam. Between 1996 and 2009, a total of approximately 130,925 tons of spawning gravel was added to the creek. The programs' interim annual spawning gravel addition target is 25,000 tons per year, but due to a lack of funding, only an average of 9,358 tons has been placed annually since 1996.

In 2010, the first annual evaluation of spawning gravel implementation and monitoring was submitted to NMFS as a requirement under the 2009 Biological Opinion. In 2012, Reclamation prepared a Categorical Exclusion Checklist to place 10,000 tons of spawning gravel at four locations: Guardian Rock/Below N.E.E.D. Camp, Placer Bridge, Clear Creek Crossing/Bridge, and Tule Backwater.

35.3.6.3 Clear Creek Mercury Abatement and Fisheries Restoration Project

The Lower Clear Creek Aquatic Habitat and Waste Discharge Improvement Project was initiated to remove the long-term impacts of mercury contamination in Lower Clear Creek and to create over five acres of new wetlands. The mercury sources are dredge-mined tailings from more than 200 historic gold and gravel mines in the watershed. The tailings are located on the properties adjacent to Clear Creek and in gravels historically used for spawning gravel supplementation. This is being completed in accordance with CVPIA actions. One of the first projects was the removal of the McCormick-Saeltzer Dam in 2000, which had blocked fish passage to upper Clear Creek. Other projects include gravel augmentation of over 10,000 tons of gravel (as described below), revegetation of some parts of the channel, monitoring, and modeling,

35.3.6.4 Iron Mountain Mine Superfund Site

The Iron Mountain Mine Superfund Site on Spring Creek had discharged acid mine drainage into several creeks that are tributary to Keswick Reservoir and the Sacramento River since the late 1890s. The interim remedies include source control, acid mine drainage collection and treatment, and water management, including water diversions and coordinated releases of contaminated surface water from Spring Creek Debris Dam with dilution flows released from Shasta Lake. In 2008, the U.S. Environmental Protection Agency indicated that the interim remedies were operational and had reduced metal loading discharges by 95 percent as compared to pre-project conditions. A final restoration plan for natural resources injuries due to Iron Mountain Mine was adopted in 2002 by USFWS, CDFW, National Oceanic and Atmospheric Administration, U.S. Bureau of Land Management, and Reclamation, and those programs are being implemented.

35.3.6.5 Mainstem Sacramento River Gravel Augmentation Program

The Mainstem Sacramento Gravel Augmentation Program is an ongoing Reclamation project that helps meet requirements of Section 3406 (b)(13) of the CVPIA to restore and replenish spawning gravel and rearing habitat for salmonid species.

Reclamation began placing salmonid spawning gravel in the Sacramento River approximately 0.25 miles downstream of Keswick Dam in August 2011. The project will place approximately 5,000 tons/year of gravel into the river to help improve spawning habitat for Chinook salmon and steelhead.

35.3.6.6 Cottonwood Creek Geomorphological Analyses and Sediment Budget

Severe streambank erosion along the main channels of Cottonwood Creek, particularly in the lower watershed, is prompting landowners to implement piecemeal "emergency" responses, which can include significant bank armoring and may cause new problems or exacerbate existing problems elsewhere along the channel. As a result, a coordinated stream restoration/management effort that emphasizes watershed-wide processes and is supported by the most recent geomorphic analyses tools is needed. To meet this need, the Cottonwood Creek Geomorphological Analyses and Sediment Budget goal is to develop a sediment budget for Cottonwood Creek based upon geomorphological data from 1939 to present; quantify spatial and temporal characteristics of sediment supply, storage, and transport in the system, and to identify the effects of sediment transport dynamics on perceived channel and watershed changes. The project will include the collection of needed additional data; and synthesis of currently available data to complete the sediment budget and answer the questions posed below.

A comprehensive synthesis of previously existing and supplemental data would be conducted incorporating the most current geomorphic analysis methods. The interpretation would call on cross-disciplinary expertise and will target specific questions of practical interest to local stakeholders such as: 1) How “stable” is the stream channel given historic and current natural conditions and land management?; 2) What roles do in-channel islands play and how might the practice of moving these islands affect the upstream and downstream channel and habitat conditions?; 3) Is current channel configuration a limiting factor to aquatic or terrestrial organisms of concern?; 4) Is the channel instability due to the amount of aggregate being removed by gravel mining?; and 5) Are current land use practices affecting the sediment budget in such a way as to create channel instability, and if so, how? The main concern is the channel instability of the lower watershed and how the bed material budget may be affecting channel response to differing flow events.

The Cottonwood Creek Working Group (CCWG) is working with Graham Matthews & Associates to insert three separate gages into the Cottonwood Creek system. Other portions of the creek will have sporadic samples taken to also assist with the project. The first gage went into the creek in January 2010.

35.3.6.7 Cottonwood Creek Non-Native Invasive Species Eradication Program

The Cottonwood Creek Non-Native Invasive Species Eradication Program is part of the Anadromous Fish Restoration Program (AFRP) and is being administered by the CCWG. The Nonnative Invasive Plant Management and Control Project was funded in Fiscal Year 2009 to complete the environmental compliance documents and permitting to eradicate non-native noxious and invasive (NIS) plants within the riparian corridor of Cottonwood Creek. Non-native plant inventories of the targeted species were completed this year to assist with the NEPA effects analysis.

35.3.6.8 Mill Creek Riparian Assessment

The need to restore and maintain riparian habitat in Mill Creek is identified by AFRP and in the CALFED ERP goals, objectives, and targets. The AFRP is one of five CVPIA programs that has been integrated with the ERP. Both of these programs prioritize establishment, restoration, and maintenance of anadromous fish habitat on this stream, particularly in the arena of riparian habitat and flow enhancement. In response to this identified need, Reclamation and USFWS are implementing the Mill Creek Riparian Assessment. The project includes: 1) riparian habitat and condition mapping and vegetation classification of the Mill Creek watershed, 2) identifying and prioritizing areas that should be restored, enhanced, and/or preserved in addition to existing conservation easements, and 3) identifying the types of restoration actions that should occur at the prioritized sites.

35.3.6.9 Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project

Deer Creek, in Tehama County, features unique habitat that makes it a very important resource for anadromous fish in the Sacramento Valley. There are three diversion dams and four screened diversion ditches in Deer Creek. Inadequate flow for upstream passage is the most significant problem in Deer Creek. The Deer Creek Irrigation District (DCID) Dam is the uppermost dam on Deer Creek. The DCID Dam is a flashboard dam with a screened diversion. During the floods in 1997, portions of this structure were damaged, creating fish passage issues.

DWR staff is monitoring the upstream and downstream stage differential at the DCID Dam. Work is also underway by DCID, DWR, and CDFW to develop an environmental flow enhancement program in lower Deer Creek. The goal of the enhancement program is to increase fish transportation flows downstream of the DCID Dam. There are over 25 miles of prime spawning habitat upstream of the DCID Dam. DWR's Fish Passage Improvement Program (FPIP) and Northern Region staff are completing the detailed topographic survey of the area and preliminary engineering investigation.

In August 2007, DCID, DWR's Northern Region Office, and CDFW signed a Memorandum of Agreement (Agreement) for the construction, operation, maintenance and monitoring of a flow enhancement program on Deer Creek. DCID recognizes the need for a long-term solution to the fish transportation issues in Deer Creek and has continued to work with the DWR, Deer Creek Watershed Conservancy, Tehama County, CDFW, and NMFS. A Conceptual Framework for the Deer Creek Flow Enhancement Program was developed by DWR. This framework was designed to fulfill the water needs of local agricultural and domestic water users, while achieving the fisheries water flow objectives in Deer Creek.

35.3.6.10 Yolo County Habitat/Natural Community Conservation Plan

The Yolo County Habitat Joint Powers Authority, consisting of five local public agencies, launched the Yolo Natural Heritage Program in March 2007. This effort includes the continuing preparation of a joint HCP/NCCP. Member agencies include Yolo County and the Cities of Davis, Woodland, West Sacramento, and Winters.

The HCP/NCCP describes the measures that local agencies will implement in order to conserve biological resources, obtain permits for urban growth and public infrastructure projects, and continue to maintain the agricultural heritage and productivity of Yolo County. The nearly 653,820-acre planning area provides habitat for covered species occurring within five dominant habitats/natural communities. The plan proposes to address 63 covered species, including seven state-listed species: palmate-bracted bird's-beak, Colusa grass, Crampton's tuctoria, giant garter snake, Swainson's hawk, western yellow-billed cuckoo, and bank swallow. Interim conservation activities include acquiring permanent conservation easements for sensitive species habitat in the plan area.

35.3.6.11 Yolo Bypass Wildlife Area Land Management Plan

The Yolo Bypass Wildlife Area consists of approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass. The bypass conveys seasonal high flows from the Sacramento River to help control river stage and protect the cities of Sacramento, West Sacramento, and Davis, as well as other local communities, farms, and lands from flooding. Substantial environmental, social, and economic benefits are provided by the Yolo Bypass, benefiting the people of the State of California.

The stated purposes of the Yolo Bypass Wildlife Area Land Management Plan are to: (1) guide the management of habitats, species, appropriate public use, and programs to achieve CDFW's mission; (2) direct an ecosystem approach to managing the Yolo Bypass Wildlife Area in coordination with the objectives of the CALFED ERP; (3) identify and guide appropriate, compatible, public-use opportunities within the Yolo Bypass Wildlife Area; (4) direct the management of the Yolo Bypass Wildlife Area in a manner that promotes cooperative relationships with adjoining private-property owners; (5) establish a descriptive inventory of the sites and the wildlife and plant resources that occur in the Yolo Bypass Wildlife Area; (6) provide an overview of the Yolo Bypass Wildlife Area's operation, maintenance, and personnel requirements to implement management goals, and serve as a planning aid for preparation of the annual budget for the Bay- Delta Region (Region 3); and (7) present the environmental documentation necessary for compliance with State and federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.

35.3.6.12 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan

The Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan is being prepared jointly by DWR and Reclamation to address Reasonable and Prudent Alternative (RPA) Actions I.6.1 and I.7 of the 2009 NMFS Biological Opinion to restore floodplain rearing habitat and reduce migratory delays and loss of salmon, steelhead, and sturgeon in the Yolo Bypass. The implementation plan describes the objectives and performance measures for these actions and potential actions for further evaluation. The implementation plan was submitted to NMFS in September 2012 for concurrence of the plan and for the initiation of environmental documentation. The NMFS concurred with the implementation plan in November 2012. The environmental documentation is currently being completed.

35.3.6.13 Cache Slough Complex Restoration

The Cache Slough Complex is located in the northern Delta where Cache Slough and the southern Yolo Bypass meet. It currently includes Liberty Island, Little Holland Tract, Prospect Island, Little Egbert Tract and the surrounding waterways. Levee height on these tracts is restricted and designed to allow overtopping in large flow events to convey water from the upper Yolo Bypass. Since 1983 and 1998 respectively, Little Holland Tract and Liberty Island have remained breached. Restoration is occurring naturally on the islands. Restoration in the Cache Slough Complex was identified as an Interim Delta Action by Governor Schwarzenegger in July 2007.

The Cache Slough Complex has potential for restoration success because of its relatively high tidal range, historic dendritic channel network, minimal subsidence, and remnant riparian and vernal pool habitat. Restoration efforts would support native species, including delta smelt, longfin smelt, Sacramento splittail, and Chinook salmon, by creating or enhancing natural habitats and improving the food web fish require. Surrounding lands that are at elevations that would function as floodplain or marsh if not separated by levees could also be included in the Cache Slough Area. This broader area includes roughly 45,000 acres of existing and potential open water, marsh, floodplain, and riparian habitat. The goals of restoration in the Cache Slough Complex are to: 1) re-establish natural ecological processes and habitats to benefit native species, 2) contribute to scientific understanding of restoration ecology, and 3) maintain or improve flood safety. Three restoration actions are being considered in the Cache Slough Complex, including restoration actions at Calhoun Cut, Little Holland Tract, and Prospect Island.

35.3.6.14 Lower Mokelumne River Spawning Habitat Improvement Project

The Mokelumne River is tributary to the Delta and supports five species of anadromous fish. The proposed project would initially place 4,000 to 5,000 cubic yards of suitably sized salmonid spawning gravel annually for a three-year period at two specific sites, and then provide annual supplementation of 600 to 1,000 cubic yards thereafter. Fall-run Chinook salmon and steelhead are the primary management focus in the river. Availability of spawning gravel in this section of the Mokelumne River has been determined to be deficient because historic gold and aggregate mining operations removed gravel annually and upstream dams have reduced gravel transport to the area. This area was chosen because it is known to have supported fall-run Chinook salmon and steelhead spawning in the past and because the substrate is suitable for habitat improvement.

35.3.6.15 North Delta Flood Control and Ecosystem Restoration Project

The North Delta Flood Control and Ecosystem Restoration Project is proposed near the confluence of the Cosumnes and Mokelumne rivers by DWR and encompasses approximately 197 square miles. Consistent with objectives contained in the CALFED ROD, the project is intended to improve flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. These actions are focused on McCormack-Williamson Tract and Staten Island. The project would implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures in the 197 square-mile project study area.

The proposed project as described in the Final EIR included: levee modifications to allow controlled flow across McCormack-Williamson Tract and to mitigate hydraulic impacts; channel dredging to increase flood conveyance capacity; an off-channel detention basin on Staten Island; ecosystem restoration where floodplain forests and marshes would be developed at McCormack-Williamson Tract and the Grizzly Slough property; setback levee on Staten Island to expand the floodway conveyance; opening up the southern portion of McCormack-Williamson Tract to boating; improving the Delta Meadows property; providing access and interpretive kiosks for wildlife viewing; and providing restroom, circulation, parking, and signage infrastructure to support such uses.

35.3.6.16 Fish Screen Project at Sherman and Twitchell Islands

The Fish Screen Project south of Rio Vista is proposed by CDFW and involves installing fish screens on up to 10 unscreened agricultural intakes used to irrigate State-owned lands on Sherman and Twitchell islands in the Delta. The project is intended to contribute to the protection of delta smelt and other sensitive aquatic species and the restoration of habitat in the Delta.

35.3.6.17 Dutch Slough Tidal Marsh Restoration

The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, would restore wetland and uplands and provide public access to the 1,200-acre Dutch Slough property. The property is composed of three parcels separated by narrow man-made sloughs. The project is a cooperative partnership between DWR, the California Coastal Conservancy, CDFW, the City of Oakley, the Ironhouse Sanitary District, Reclamation Districts 2137 and 799, the Natural Heritage Institute, and landowners. The project will provide ecosystem benefits, including habitat for sensitive species such as winter-run Chinook salmon, Sacramento splittail, and many waterfowl species. It also would be designed and implemented to maximize opportunities to assess the development of those habitats and measure ecosystem responses so that future Delta restoration projects will be more successful. DWR approved the Final EIR for the project in March 2010.

35.3.6.18 Franks Tract Project

DWR and Reclamation are conducting studies to evaluate the feasibility of modifying the hydrodynamic conditions near Franks Tract to improve Delta water quality and enhance the aquatic ecosystem. The results of these studies have indicated that modifying the hydrodynamic conditions near Franks Tract may substantially reduce salinity in the Delta and protect fishery resources, including populations of delta smelt, a federally listed and State-listed species that is endemic to the Delta. As a result, DWR and Reclamation propose to implement the Franks Tract Project to improve water quality and fisheries conditions in the Delta. DWR and Reclamation are evaluating the installation of operable gates to control the flow of water at key locations (Threemile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. The project gates would be operated seasonally and during certain hours of the day, depending on fisheries and tidal conditions. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation. The Franks Tract Project is consistent with ongoing planning efforts for the Delta to help balance competing uses and create a more sustainable system for the future. By protecting fish resources, this project also could improve operational reliability of the SWP and CVP because curtailments in water exports (pumping restrictions) are likely to be less frequent. Franks Tract was previously evaluated as part of DWR’s Flooded Island Pre-Feasibility Study Report.

35.3.6.19 Solano County Multi-species Habitat Conservation Plan

The Solano HCP is intended to support the issuance of an incidental take permit under the federal Endangered Species Act for a period of 30 years. This permit is required for the Solano Project Contract Renewal Biological Opinion between USFWS and Reclamation. The scope of the Solano HCP was expanded beyond the requirements of the Biological Opinion to include additional voluntary applicants and additional species for incidental take coverage. These additional species include federally listed fish species under the jurisdiction of NMFS and species listed as threatened or endangered under the California Endangered Species Act. The HCP further addresses other species of concern (i.e., species recognized by groups such as the CDFW and the California Native Plant Society as having declining or vulnerable populations, but not officially listed as threatened or endangered species). Thirty-seven species are proposed to be covered under the Solano HCP. The minimum geographical area to be covered is the Solano County Water Agency’s contract service area that includes the cities of Fairfield, Vacaville, Vallejo, Suisun City, the Solano Irrigation District, and the Maine Prairie Water District. The area covered by the HCP includes all of Solano County and a small portion of Yolo County. The HCP includes a Coastal Marsh Natural Community Conservation Strategy designed to maintain the water and sediment quality standards, hydrology, and ecological functions of this natural community; contribute to the restoration of tidally influenced coastal marsh habitat; contribute to the conservation and recovery of associated covered species; and promote habitat connectivity. Primary conservation actions include preservation (primarily through avoidance), restoration, invasive species control, and improvement of water quality. The plan area covers 580,000 acres, which includes 12,000 acres of proposed development and 30,000 acres that will be preserved.

35.3.6.20 Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation

On March 2, 1987, the Suisun Marsh Preservation Agreement was signed by DWR, CDFW, Reclamation, and the Suisun Resource Conservation District. The purpose of the agreement was to establish mitigation for impacts on salinity from the SWP, CVP, and other upstream diversions.

In 2001, USFWS, Reclamation, CDFW, DWR, NMFS, the Suisun Resource Conservation District, and CALFED (the Principal Agencies) directed the formation of a charter group to develop a plan for Suisun Marsh that would balance the needs of CALFED, the Suisun Marsh Preservation Agreement, and other plans by protecting and enhancing existing land uses, existing waterfowl and wildlife values including those associated with the Pacific Flyway, endangered species, and State and federal water project supply quality. In addition to the Principal Agencies, the charter group included other regulatory agencies such as USACE, the San Francisco Bay Conservation and Development Commission, SWRCB, and RWQCBs. In 2011, the Principal Agencies published a Final EIS/EIR for the Suisun Habitat Management, Preservation, and Restoration Plan. The plan purposes/objectives are:

- Habitats and Ecological Processes to implement CALFED Ecosystem Restoration Program Plan
- Public and Private Land Use to maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh
- Levee System Integrity to protect property, infrastructure, and wildlife habitats from catastrophic flooding
- Water Quality to protect, and where possible, improve water quality for beneficial uses in Suisun Marsh

The proposed project will restore 5,000 to 7,000 acres of tidal marsh and provide protection and enhancement of 40,000 to 46,000 acres of managed wetlands. The plan includes environmental commitments and mitigation measures, adaptive management programs, and reporting through annual reports over the 30-year time frame of the plan.

35.3.6.21 San Joaquin River Restoration Program

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The restoration program is the product of more than 18 years of litigation, which culminated in a Stipulation of Settlement on the lawsuit known as Natural Resources Defense Council (NRDC), et al., v. Kirk Rodgers, et al. The settling parties reached agreement on the terms and conditions of the settlement, which was subsequently approved by Federal Court on October 23, 2006. The settling parties include the NRDC, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce. The settlement's two primary goals are to:

- Restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish, and

- Reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the settlement.

The settlement requires specific releases of water from Friant Dam to the confluence of the Merced River, which are designed primarily to meet the various life stage needs for spring- and fall-run Chinook salmon. The release schedule assumes continuation of the current average Friant Dam release of 116,741 acre-feet, with additional flow requirements depending on the year type. The project was authorized and funded with the passage of the San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11). Interim flows began in October, 2009. There are many physical improvements within and near the San Joaquin River that will be undertaken to fully achieve the river restoration goal. The improvements will occur in two separate phases that will focus on a combination of water releases from Friant Dam, as well as structural and channel improvements.

35.4 Cumulative Effects Analysis by Resource

The potential for implementation of the range of alternatives evaluated in this DEIR/EIS to result in a cumulatively considerable incremental contribution was determined for each resource based upon the significance criteria for each resource, as described in Chapters 6 through 31. To reduce any cumulatively considerable incremental contributions from the NODOS Project action alternatives to an overall cumulative effect, feasible mitigation measures are proposed for all potentially substantial direct and indirect effects. In some cases, no feasible mitigation could be applied to reduce effects. In these cases, the cumulative effects are considered to be substantial and unavoidable.

35.4.1 Surface Water Resources

In Chapter 6 Surface Water Resources, changes in surface water resources are described but not assessed or evaluated to determine the significance of surface water resources changes. Impact and significance determinations that rely on the surface water resources data that are presented in Chapter 6 Surface Water Resources are described and evaluated in other resource chapters (e.g., changes in reservoir storage and river flows could affect recreation resources). Therefore, the cumulative analysis of surface water resources does not provide an assessment of significance.

Alternatives A, B, and C would be integrated with the CVP and SWP systems, and would affect CVP and SWP operations, reservoir storage, river flows downstream of the reservoirs, Delta outflow, and water supply deliveries. The alternatives were developed to improve cold water pool management in Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and the Sacramento River in drier years; increase Delta exports and SWP allocations in drier years; improve Delta water quality for municipal and industrial water users in the Delta and south of Delta, especially in summer and fall of most years, and for enhancement of aquatic resources through X2 location criteria; and stabilize Sacramento River flows to improve spawning and rearing conditions in most years. Major differences between Alternatives A, B, and C are related to the size of the proposed Sites Reservoir and the inclusion of the proposed Delevan Pipeline Intake Facilities. These differences would affect diversion patterns from the Sacramento River into the proposed Sites Reservoir, and release patterns from CVP and SWP reservoirs to provide for or respond to the operations of Sites Reservoir.

When combined with other past, present, and reasonably foreseeable future projects, there could be changes in operations of CVP and SWP facilities and related changes in reservoir storage, river flows downstream of the reservoirs, and CVP and SWP water supply deliveries under Alternatives A, B, or C.

The quantitative analysis of surface water conditions under Alternatives A, B, or C presented in Chapter 6 Surface Water Resources included conditions under past, present, and future projects under the No Project/No Action Alternative. Implementation of other reasonably foreseeable projects included in the cumulative effects analysis that are less defined than future projects under the No Project/No Action Alternative also could change CVP and/or SWP reservoir operations to meet downstream minimum instream flows or water quality objectives. The changes in operations also could change available water supplies and related CVP and SWP water deliveries. The changes could occur in three different ways:

- **Future projects that could affect overall CVP and SWP water supply operations.** These projects could result in changes to minimum instream flow in rivers affected by CVP and SWP operation, Delta outflow criteria to maintain flow and/or salinity (e.g., X2 location), reverse flow criteria for Old and Middle rivers, and diversion criteria at the south Delta intakes. Future projects which could change these criteria include the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation. However, the changes associated with the future projects would be complimentary with many of the changes associated with the proposed Project because they also would encourage improved cold water management, decreased Delta salinity, and improved spawning and rearing conditions. It is possible that the future projects in addition to this proposed Project could result in reductions in CVP and SWP exports.
- **Future projects that could change inflow patterns to CVP and SWP reservoirs or the Delta.** In response to future projects that change inflows to the reservoirs or the Delta, the CVP and SWP may need to change operations to maintain compliance with flow and water quality. These changes could result in less water available for diversion to the proposed Sites Reservoir or for CVP and SWP water deliveries. It should be noted that the No Project/No Action Alternative and Alternatives A, B, and C include an assumption that water demands in the Sacramento Valley would increase by approximately 500,000 acre-feet/year. Future projects not included in the No Project/No Action Alternative would either increase the water demand further or change the diversion pattern throughout the year. The Woodland-Davis Water Supply Project and El Dorado Water and Power Authority Supplemental Water Rights Project could reduce Sacramento River flows downstream of the City of Sacramento in some months due to an increase in diversions for these regional water supplies. The EBMUD Camanche Water Rights Permit Extension, Semitropic Water Storage District Delta Wetlands, Los Vaqueros Reservoir Expansion Phase II, and Upper San Joaquin River Basin Storage Investigation could change flow patterns in the Delta.
- **Future projects that could increase flexibility in water demand patterns.** Water users that expand their water supply portfolio may have more flexibility to change the historical patterns of CVP and SWP water deliveries. For example, water users that have diverted water during the summer months for irrigation could change their delivery patterns to other months if the water was diverted for groundwater recharge. The water user would then use groundwater during the irrigation season. Future projects that may be able to increase flexibility in water demand patterns include the EBMUD Water Supply Management Program 2040, Eastern San Joaquin Integrated Conjunctive Use Program, and the Bay Area Regional Desalination Project.

35.4.2 Surface Water Quality

Water quality degradation does exist in the Central Valley streams when considering past and present conditions. As described in Chapter 7 Surface Water Quality, the No Project/No Action Alternative would not result in substantial adverse effects to surface water quality as compared to Existing Conditions.

Several factors related to future projects evaluated in the cumulative effects analysis could affect water quality in the Extended Study Area (regions south of the Delta where Delta exports are used) and the Secondary Study Area (waterbodies that could be affected by proposed Project operations). None of the future projects evaluated in the cumulative effects analysis would result in construction projects within the Primary Study Area (area where the proposed Project storage and conveyance facilities would be constructed).

35.4.2.1 Alternative A

Extended Study Area and Secondary Study Area

Alternative A was developed to improve cold water management and Delta water quality, and to stabilize flows downstream of the CVP and SWP reservoirs. These actions would result in either no change or improvements to surface water quality including salinity, bromides, and chlorides in the Delta; and metals, sediment, nutrients, and other constituents, including mercury, in the waterbodies affected by proposed Project operations.

Alternative A also would result in changes in the operation of San Luis Reservoir to reduce the potential for algal blooms and associated water quality degradation. The associated water quality improvement under Alternative A and water quality improvement under the future San Luis Reservoir Low Point Improvement Project would result in improved water quality for users of water from San Luis Reservoir.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the implementation of CVPIA and CALFED, SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to improve water quality. Other future projects also are being considered to improve water quality in the San Joaquin River and the Delta, including the continuation of the South Delta Temporary Barriers Operations, Franks Tract Project, Stockton Deep Water Ship Channel Dissolved Oxygen Project, Grassland Bypass Project, San Luis Reservoir Low Point Improvement Project, Central Valley Irrigated Lands Regulatory Program, CV-SALTS, and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects that are being considered to improve water quality would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality, and could result in cumulatively beneficial effects.

Implementation of projects that could result in increased amounts of wetland habitat that would be subject to periodic inundation and drying cycles could result in increased water quality degradation due to sediment and methylmercury. As described in Chapter 7 Surface Water Quality, Alternative A would not result in substantial adverse effects from increased contributions of mercury from upstream sources due to changes in flow patterns on the Sacramento and Feather rivers; and would not include expansion of ecosystem restoration areas that would contribute to methylmercury water quality degradation. Future projects considered in the cumulative effects analysis could contribute to mercury water quality issues, including the Bay Delta Conservation Plan, Delta Plan, Regional Advanced Mitigation Program, Clear Creek Mercury Abatement and Fisheries Restoration Project, Iron Mountain Mine Superfund Site, Yolo

County Habitat/Natural Community Conservation Plan, Yolo Bypass Wildlife Area Land Management Plan, Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan, and Cache Slough Complex Restoration. Other future projects could be operated in a manner to avoid mercury water quality issues, including the Dutch Slough Tidal Marsh Restoration and the Suisun Marsh Habitat, Management, Preservation, and Restoration Plan Implementation.

Because Alternative A would improve cold water management and Delta water quality, and would not contribute to the mercury concentrations in the Delta, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial adverse cumulative effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Without mitigation, Alternative A could have potentially substantial effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation or maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality.

35.4.2.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 7 Surface Water Quality, water quality effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Water quality effects in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial adverse effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would eliminate or reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Primary Study Area.

35.4.2.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 7 Surface Water Quality, water quality effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Water quality effects in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on water quality in the Primary Study Area. These effects could be caused by temporary or short-term construction-related activities that cause sediment, petroleum, or other substances to enter the waterways in runoff. As described in Chapter 7 Surface Water Quality, mitigation measures would eliminate or reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on surface water quality in the Primary Study Area.

35.4.3 Fluvial Geomorphology and Riparian Habitat

Fluvial geomorphologic changes are occurring in the Central Valley streams that alter natural river processes including bank erosion, sediment transport, and changes in river sinuosity and river bed dimensions. As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the No Project/No Action Alternative would not result in substantial adverse effects to fluvial geomorphologic conditions as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect fluvial geomorphologic conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.3.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the amount of alteration to natural river processes and characteristics associated with implementation of Alternative A in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative because the hydraulic changes would not substantially change flood flows, which is when most geomorphic effects occur. The effects would not be substantial. Changes in sediment transport and local flow patterns near the intakes under Alternative A are not anticipated to affect sediment concentration in the Sacramento River, and therefore, would not have a substantial effect on sediment concentration, turbidity, and water clarity. Alternative A also is not anticipated to result in substantial adverse effects on natural river meandering, bank erosion, large woody debris occurrence, riparian aquatic habitat, and spawning gravel conditions as compared to Existing Conditions and the No Project/ No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, Butte County Regional Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in the Sacramento, Feather, and American rivers. However, implementation of some projects, including the Trinity River Restoration Program, Mainstem Sacramento River Gravel Augmentation Program, Cottonwood Creek Geomorphological Analyses and Sediment Budget, Cache Slough Complex Restoration, North Delta Flood Control and Ecosystem Restoration Project, Dutch Slough Tidal Marsh Restoration, Franks Tract Project, and San Joaquin River Restoration Program, could result in changes to fluvial geomorphologic conditions that would include both beneficial effects, such as beneficial effects due to Cottonwood Creek Geomorphological Analysis and Sediment Budget, and potentially locally substantial adverse effects. However, the local effects could be reduced after implementation of mitigation measures similar to measures described in Chapter 8 Fluvial Geomporphology and Riparian Habitat to reduce fluvial geomorphologic effects.

Implementation of projects that could result in increased amounts of wetland habitat that would be subject to periodic inundation and drying cycles could result in changes in sediment transport and deposition in the Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay. These effects could be potentially substantial and would occur without implementation of Alternative A. Alternative A would not contribute to the changes in sediment transport and deposition. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area or Secondary Study Area.

Primary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, alteration to natural river processes and characteristics in the Primary Study Area would not occur at the proposed Delevan Pipeline Intake Facilities location due to local geology and existing upstream bank protection; the fish screen would also stabilize a portion of the river bank. Local removal of riparian vegetation at the proposed intake location also would not result in a substantial adverse effect on habitat complexity in the Sacramento River. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and the identified future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions.

35.4.3.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, the fluvial geomorphologic effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and most of the Secondary Study Area. Fluvial geomorphologic effects in parts of the Secondary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. However, the amount of alteration to natural river processes and characteristics associated with Alternative B implementation in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

Primary Study Area

Fluvial geomorphologic effects in the Primary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. The amount of alteration to natural river processes and characteristics in the Primary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

35.4.3.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 8 Fluvial Geomporphology and Riparian Habitat, fluvial geomorphologic effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and most of the Secondary Study Area. Fluvial geomorphologic effects in parts of the Secondary Study Area along the Sacramento River under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. However, the amount of alteration to natural river processes and characteristics in the Extended Study Area and Secondary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

Primary Study Area

Fluvial geomorphologic effects in the Primary Study Area along the Sacramento River under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. The amount of alteration to natural river processes and characteristics in the Primary Study Area would be minor as compared to Existing Conditions and the No Project/No Action Alternative, and the effects would not be substantial. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on fluvial geomorphologic conditions in the Extended Study Area and Secondary Study Area.

35.4.4 Flood Control and Management

Adverse effects to flood control and management are caused by substantially altering drainage patterns, placement of structures within a 100-year Flood Hazard Area, and/or exposure of people or structures to substantial risks from flooding. As described in Chapter 9 Flood Control and Management, the No Project/No Action Alternative would result in no effects to flood control and management as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect flood management conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.4.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 9 Flood Control and Management, anticipated changes in CVP and SWP reservoir storage and release operations under Alternative A are not anticipated to reduce flood storage potential or increase river flows during flood events.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in the Sacramento, Feather, American, and San Joaquin rivers and to not increase flood risks on those rivers. Implementation of local water supply, flood management, and ecosystem improvement projects (including Delta Plan, North Delta Flood Control and Ecosystem Restoration Project, and San Joaquin River Restoration Program) are not anticipated to increase flood risks on the major rivers or minor streams except for areas that are to be inundated under the project-specific actions, such as expansion of ecosystem habitat in currently non-inundated lands. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 9 Flood Control and Management, construction of facilities under Alternative A are not anticipated to result in substantial effects to flood management due to use of standard design criteria to avoid alteration of drainage patterns or impede or redirect flood flows within a 100-year Flood Hazard Area. Implementation of Alternative A would result in a potentially beneficial effect to areas located downstream of the proposed Sites and Golden Gate dams because future flood flows would be captured in the proposed Sites Reservoir and other proposed storage facilities. Implementation of Alternative A also could be operated to reduce peak flows in the Sacramento River downstream of Colusa by up to 5,900 cfs.

Potential effects from increased exposure to flood risks also are not considered to be substantial because the proposed Sites Reservoir would be designed and constructed pursuant to conservative guidelines and design criteria to prevent failure with multiple lines of defense or design redundancy as required to meet both DWR’s Division of Safety of Dams and Reclamation’s design standards. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management in the Primary Study Area.

35.4.4.2 Alternative B

As described in Chapter 9 Flood Control and Management, flood management effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area,. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management.

35.4.4.3 Alternative C

As described in Chapter 9 Flood Control and Management, flood management effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area, and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on flood control and management.

35.4.5 Groundwater Resources

Adverse effects to groundwater resources are caused by depletion of groundwater supplies or increased groundwater elevations that are incompatible with neighboring land uses. As described in Chapter 10 Groundwater Resources, the No Project/No Action Alternative would result in no effects to groundwater resources as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect groundwater resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.5.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, improved CVP and SWP water supply reliability in the Extended Study Area could result in reduced use of groundwater in those areas, or additional groundwater recharge. These conditions would not result in substantial effects as compared to Existing Conditions or the No Project/No Action Alternative. Changes in flow regimes in the Secondary Study Area rivers under Alternative A are not expected to substantially affect groundwater recharge in areas adjacent to the rivers and streams and therefore would not result in substantial effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas, or additional groundwater recharge, and no substantial effects to groundwater levels along streams that convey CVP and SWP water supplies.

Implementation of ecosystem restoration projects also could affect groundwater by raising groundwater levels on adjacent lands. In some cases, the increased groundwater levels could be beneficial. However, if the groundwater levels rose into the root zones of agricultural lands or caused effects to levee and building foundations, the effects could be adverse. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; Regional Advanced Mitigation Program; Semitropic Water Storage District Delta Wetlands; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Deer Creek Irrigation District Dam Fish Passage and Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures, such as monitoring and installation of groundwater dewatering wells, could reduce the effects. In some cases, the effect could be substantial and unavoidable. For example, the San Joaquin River Restoration Program EIS/EIR identified potential groundwater effects to be substantial and unavoidable in some locations.

Although potentially substantial and unavoidable effects to groundwater resources could occur under future projects, Alternative A would not result in similar effects. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 10 Groundwater Resources, without mitigation, operation of the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities are anticipated to result in potentially substantial effects due to increased groundwater levels that could adversely affect adjacent agricultural areas. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.5.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, groundwater effects from implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater effects in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on groundwater resources in the Primary Study Area near the proposed Holthouse Reservoir Complex and proposed Terminal Regulating Reservoir. As described in Chapter 10 Groundwater Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and the future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.5.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 10 Groundwater Resources, groundwater effects from implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater effects in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on groundwater resources in the Primary Study Area near the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities. As described in Chapter 10 Groundwater Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater resources.

35.4.6 Groundwater Quality

Adverse effects to groundwater quality are caused by depletion of groundwater supplies that result in groundwater quality changes or contamination during construction and operation of new facilities. As described in Chapter 11 Groundwater Quality, groundwater quality under the No Project/No Action Alternative would be degraded as compared to Existing Conditions because of continued withdrawals of groundwater or minimal groundwater recharge in areas with groundwater overdraft.

Future projects evaluated in the cumulative effects analysis could affect groundwater quality in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.6.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, improved CVP and SWP water supply reliability in the Extended Study Area could result in improved groundwater quality due to reduced use of groundwater in those areas, or additional groundwater recharge. These conditions would result in a potentially beneficial effect or minimal effects as compared to the Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas or additional groundwater recharge which would improve groundwater quality. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation activities associated with Alternative A could result in potentially substantial effects from hazardous materials contamination during use of equipment or exposure during excavation. Groundwater contamination also could occur if septic system and well abandonment actions, installation of groundwater dewatering equipment and disposal of withdrawn groundwater, or installation of vault toilets at the proposed recreation facilities are not completed in a manner required by the State and Colusa and Glenn counties to prevent groundwater contamination. As described in Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality.

35.4.6.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, groundwater quality effects due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater quality in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on groundwater quality in the Primary Study Area near the proposed Holthouse Reservoir Complex and proposed Terminal Regulating Reservoir. As described in

Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Primary Study Area.

35.4.6.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 11 Groundwater Quality, groundwater quality effects due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Groundwater quality in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on groundwater quality in the Primary Study Area near the proposed Holthouse Reservoir Complex, proposed Terminal Regulating Reservoir, and the forebay at the proposed Delevan Pipeline Intake Facilities. As described in Chapter 11 Groundwater Quality, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on groundwater quality in the Primary Study Area.

35.4.7 Aquatic Biological Resources

Adverse effects to aquatic biological resources are caused by degraded water quality, habitat modification, interference with fish passage, and predation risk. The No Project/No Action Alternative would not result in substantial effects to aquatic biological resources in most waterbodies as compared to Existing Conditions. As described in Chapter 12 Aquatic Biological Resources, aquatic habitat conditions in the American River would continue to be degraded under the No Project/No Action Alternative as compared to Existing Conditions because of more frequent occurrences of low flows and increased water temperatures that would adversely affect steelhead, green sturgeon, Pacific lamprey, river lamprey, Sacramento splittail, striped bass, and American shad.

Future projects evaluated in the cumulative effects analysis could affect aquatic biological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.7.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, implementation of Alternative A could affect aquatic biological resources. Alternative A was developed to enhance the ability to improve cold water management and Delta water quality, augment Delta outflows, and stabilize flows in the rivers, which in general could result in beneficial effects. However, implementation of Alternative A would reduce the frequency of inundation of the Yolo Bypass as compared to Existing Conditions and the No Project/No Action Alternative. Alternative A also could result in potentially substantial effects to steelhead, green sturgeon, and white sturgeon as compared to both Existing Conditions and the No Project/No Action Alternative, and potentially substantial effects to Sacramento splittail and largemouth bass as compared to the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to benefit aquatic biological resources and would not be approved if existing regulatory requirements adopted to protect aquatic biological resources were not incorporated into the future projects. Implementation of ecosystem restoration projects also would enhance aquatic habitat conditions. Future ecosystem projects considered in the cumulative effects analysis that could benefit aquatic biological resources include the implementation of CVPIA and CALFED objectives; Delta Plan; Anadromous Fish Restoration Program; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Butte County Regional Conservation Plan; El Dorado Irrigation District Folsom Lake Temperature Control Device; Lake Natoma Lower American River Temperature Reduction Project; North Bay Aqueduct Alternative Intake; South Delta Temporary Barriers Project; Stockton Deep Water Ship Channel Dissolved Oxygen Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Iron Mountain Mine Superfund Site; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; Lower Mokelumne River Spawning Habitat Improvement Project; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects could result in beneficial effects, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, sediment removal activities near the proposed Project intakes and construction of the proposed Delevan Pipeline Intake Facilities could result in potentially substantial effects in the Sacramento River to Central Valley winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-run Chinook salmon, Central Valley late-fall-run Chinook salmon, steelhead, Pacific lamprey, river lamprey, hardhead, Sacramento-San Joaquin roach, Sacramento splittail, striped bass, American shad, largemouth bass, green sturgeon, and white sturgeon as compared to Existing Conditions and the No Project/No Action Alternative. Construction and sediment removal activities could have potentially substantial effects in waterbodies in the Primary Study Area.

As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources.

35.4.7.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, the effects of implementation of Alternative B on aquatic biological resources would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

The effects of implementation of Alternative B on aquatic biological resources in the Primary Study Area would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could have potentially substantial effects on aquatic biological resources in waterbodies in the Primary Study Area due to construction and operation effects, and the periodic removal of sediment as compared to Existing Conditions and the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Primary Study Area.

35.4.7.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 12 Aquatic Biological Resources, the effects of implementation of Alternative C on aquatic biological resources would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

The effects of implementation of Alternative C on aquatic biological resources in the Primary Study Area would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could have potentially substantial effects on aquatic biological resources in the Sacramento River and to waterbodies in the Primary Study Area due to construction and operation effects, and the periodic removal of sediment as compared to Existing Conditions and the No Project/No Action Alternative. As described in Chapter 12 Aquatic Biological Resources, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on aquatic biological resources in the Primary Study Area.

35.4.8 Botanical Resources

Degradation of botanical resources does exist in the Central Valley when considering past and present conditions. As described in Chapter 13 Botanical Resources, the No Project/No Action Alternative would result in potentially beneficial or minimal effects to botanical resources as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease fall flows in the Feather River in dry water years, and late summer and fall flows in the American River in above normal, below normal, and critical dry years as compared to Existing Conditions and would therefore result in potentially substantial effects.

In the Primary Study Area, continued harvest of blue oaks for firewood and other uses under the No Project/No Action Alternative would result in potentially substantial effects to the blue oak woodlands and associated edge habitat.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect botanical resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.8.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects to botanical resources in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, Butte County Regional Conservation Plan, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat. However, the Shasta Lake Water Resources Investigation also could inundate substantial botanical resources along the existing shoreline of Shasta Lake.

Implementation of ecosystem restoration projects also could benefit botanical resources. Future ecosystem restoration projects considered in the cumulative effects analysis that could benefit botanical resources include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Semitropic Water Storage District Delta Wetlands; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Cottonwood Creek Non-native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. However, future projects that result in changes or inundation of vegetation could result in substantial effects. Mitigation measures, including preservation and/or restoration of other botanical resources, could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Dutch Slough Tidal Marsh Restoration Project EIR identified loss of some botanical resources due to inundation as substantial and unavoidable.

Implementation of Alternative A and these future projects could result in beneficial effects. However, because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below), and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative A, implementation of Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.8.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, effects on botanical resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on botanical resources in the Primary Study Area under Alternative B would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative B could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative B, implementation of Alternative B could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.8.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 13 Botanical Resources, effects on botanical resources due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources that could exist in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on botanical resources in the Primary Study Area under Alternative C would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative C could have potentially substantial effects on botanical resources in the Primary Study Area due to temporary and permanent loss of vegetation at construction locations. As described in Chapter 13 Botanical Resources, mitigation measures would reduce the effects, with the exception of botanical resources within the inundation area of the proposed Sites Reservoir, and within and adjacent to the inundation area of the proposed Holthouse Reservoir. In these areas, the effects would potentially remain substantial and unavoidable following implementation of mitigation measures. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial and unavoidable effects that would occur under Alternative C, implementation of Alternative C could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on botanical resources in the Primary Study Area.

35.4.9 Terrestrial Biological Resources

Degradation of terrestrial biological resources does exist in the Central Valley when considering past and present conditions. As described in Chapter 14 Terrestrial Biological Resources, the No Project/No

Action Alternative would result in potentially beneficial or minimal effects to terrestrial biological resources as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease fall flows in the Feather River in dry water years, and late summer and fall flows in the American River in above normal, below normal, and critical dry years as compared to Existing Conditions, resulting in potentially substantial effects.

In the Primary Study Area, continued cattle grazing in multiple wildlife habitat types and harvest of blue oaks for firewood and other uses under the No Project/No Action Alternative would result in potentially substantial effects to wildlife habitats.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect terrestrial biological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.9.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects to terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat.

Implementation of ecosystem restoration projects also would improve wildlife habitat. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved wildlife habitat include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands; Grassland Bypass Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Cottonwood Creek Non-native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. However, future projects that result in changes or inundation of habitat could result in substantial effects. Mitigation measures, including preservation and/or restoration of replacement habitat areas, could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Dutch Slough Tidal Marsh Restoration Project EIR identified loss of some wildlife habitat due to inundation as substantial and unavoidable.

Implementation of Alternative A and these future projects could result in beneficial effects. However, because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below), Alternative A could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative A, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.9.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, effects on terrestrial biological resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on terrestrial biological resources in the Primary Study Area under Alternative B would be greater than under Alternative A due to the increased size of Sites Reservoir. Implementation of Alternative B could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative B, implementation of Alternative B result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.9.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 14 Terrestrial Biological Resources, effects on terrestrial biological resources due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on terrestrial biological resources in the Primary Study Area under Alternative C would be greater than under Alternative A due to the increased size of the proposed Sites Reservoir. Implementation of Alternative C could cause potentially substantial effects on terrestrial biological resources in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 14 Terrestrial Biological Resources, mitigation measures would reduce the effects, with the exception of the loss of golden eagle foraging habitat due to inundation of the proposed Sites Reservoir. In the proposed reservoir inundation area, the effects to golden eagles would remain substantial and unavoidable following implementation of mitigation measures.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the substantial and unavoidable effects that would occur under Alternative C, implementation of Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on terrestrial biological resources.

35.4.10 Wetlands and Other Waters of the United States

Degradation of wetlands and other waters of the United States does exist in the Central Valley when considering past and present conditions. As described in Chapter 15 Wetlands and Other Waters of the United States, the No Project/No Action Alternative would result in potentially beneficial or minimal effects to wetlands and other waters as compared to Existing Conditions in most locations. However, implementation of the No Project/No Action Alternative would decrease flows in several rivers in the Secondary Study Area which would result in potentially substantial effects to the waterbodies and associated wetlands. On the Trinity River, decreased flows would occur in March and April in wet years under the No Project/No Action Alternative as compared to Existing Conditions. On the Feather River, decreased flows would occur in November and December in below normal years; August, October, and January through March in dry years; and July, November, and December in critical dry years. On the American River, decreased flows would occur in all months except December, and especially in August, September, and/or October in drier years. Flows in the Sutter Bypass and Yolo Bypass would directly affect wetlands in the bypasses. Flows under the No Project/No Action Alternative would decrease in December in wet, below normal, and dry years, and in November in below normal and dry years, as compared to Existing Conditions. Flows in the Yolo Bypass would decrease in late fall months in dry and below normal years as compared to Existing Conditions. These flow changes would result in potentially substantial effects to wetlands and other waters of the United States.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect wetlands and other waters in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.10.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects in the Extended Study Area and Secondary Study Area.

Implementation of projects considered under the cumulative effects analysis that could result in changes in CVP and SWP operation, surface water flow patterns, and ecosystem restoration (as described above as cumulative projects considered for Surface Water Resources, Fluvial Geomorphology and Riparian Habitat, Aquatic Biological Resources, Botanical Resources, and Terrestrial Biological Resources) generally are being developed to improve flow regimes in water bodies, which would benefit riparian habitat. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters.

35.4.10.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, effects on wetlands and other waters due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative B could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Primary Study Area.

35.4.10.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 15 Wetlands and Other Waters of the United States, effects on wetlands and other waters due to implementation of Alternative C would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Extended Study Area and Secondary Study Area.

Primary Study Area

Implementation of Alternative C could cause potentially substantial effects on wetlands and other waters in the Primary Study Area due to temporary and permanent loss of habitat at construction locations. As described in Chapter 15 Wetlands and Other Waters of the United States, mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on wetlands and other waters in the Primary Study Area.

35.4.11 Geology, Minerals, Soils, and Paleontology

For the proposed Project, adverse effects to geology and soils are caused by changes in erosion potential and the ability of soils to support use of septic systems with on-site wastewater disposal. Adverse effects to minerals are caused by loss of availability of known mineral resources and increased exposure of people to naturally occurring asbestos. Adverse effects to paleontological resources are caused by potential disturbance during deep excavation.

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, the No Project/No Action Alternative would result in no effects to geology, soils, minerals, and paleontology as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could result in changes to geological, soil, mineral, and paleontological resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.11.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, implementation of Alternative A would result in either no effects or minimal effects to geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to geological, soil, mineral, and paleontological resources depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, soil loss due to erosion at the modified surface water elevation of Shasta Lake and use of aggregate and sand for construction were considered to be substantial and unavoidable effects in the Shasta Lake Water Resources Investigation Preliminary Draft EIS.

Although these projects could result in adverse effects to geological, soil, mineral, and paleontological resources, implementation of Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soils, minerals, and paleontological resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation of facilities under Alternative A would result in potentially substantial effects due to erosion along the shorelines of the reservoirs and at construction locations; loss of topsoil due to construction activities; placement of some structures on soils with high shrink-swell potential which could adversely affect structural foundations; placement of septic systems on soils with limited ability for on-site wastewater disposal; and deep excavations which could adversely affect paleontological resources. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources.

35.4.11.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, effects on geological, soil, mineral, and paleontological resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on geological, soil, mineral, and paleontological resources in the Primary Study Area under Alternative B would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative B could cause potentially substantial effects on geological, soil, and paleontological resources in the Primary Study Area. As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Primary Study Area.

35.4.11.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, effects on geological, soil, mineral, and paleontological resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on geological, soil, mineral, and paleontological resources in the Primary Study Area under Alternative C would be different than under Alternative A due to the increased size of the proposed Sites Reservoir. Without mitigation, Alternative C could cause potentially substantial effects on geological, soil, and paleontological resources in the Primary Study Area. As described in Chapter 16 Geology, Minerals, Soils, and Paleontology, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on geological, soil, mineral, and paleontological resources in the Primary Study Area.

35.4.12 Faults and Seismicity

For the proposed Project, risks associated with faults and seismicity are related to exposure of people or structures to risks during and after a seismic event and associated with liquefaction or landslides; inundation by seiches or tsunamis; and increase risk due to reservoir-induced seismic events. As described in Chapter 17 Faults and Seismicity, risks associated with faults and seismicity under the No Project/No Action Alternative would be comparable to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could result in increased risks due to liquefaction or landslides near future construction locations in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.12.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, implementation of Alternative A would result in either no effects or minimal effects related to risks from faults and seismicity in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of future projects considered under the cumulative effects assessment could result in risks from faults and seismicity depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would reduce these effects. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effects related to faults and seismicity in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Without mitigation, construction and operation of proposed facilities under Alternative A would result in potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction locations of some proposed Project facilities. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity.

35.4.12.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, effects related to faults and seismicity due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects related to faults and seismicity in the Primary Study Area under Alternative B would be similar to effects under Alternative A. Without mitigation, Alternative B could cause potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area. As described in Chapter 17 Faults and Seismicity, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area.

35.4.12.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 17 Faults and Seismicity, effects related to faults and seismicity due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to faults and seismicity in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects related to faults and seismicity in the Primary Study Area under Alternative C would be similar to effects under Alternative A. Without mitigation, Alternative C could cause potentially substantial effects related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area. As described in Chapter 17 Faults and Seismicity, mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect related to seismically-induced localized landslides or liquefaction at construction sites of some proposed Project facilities in the Primary Study Area.

35.4.13 Cultural Resources

For the proposed Project, adverse effects to cultural resources are caused by substantial changes in the significance of archaeological or historic resources, or disturbance of traditional cultural properties or human remains. Conditions of cultural resources under the No Project/No Action Alternative would be comparable to Existing Conditions, with the exception of San Luis Reservoir. As described in Chapter 18 Cultural Resources, projected fluctuations of surface water elevations at San Luis Reservoir could result in potentially substantial effects under the No Project/No Action Alternative, as compared to Existing Conditions, because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted.

Future projects evaluated in the cumulative effects analysis could result in potentially substantial effects to cultural resources due to construction and operation activities in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.13.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, implementation of Alternative A would result in potentially substantial effects to cultural resources in the regulating reservoirs of the Extended Study Area because complete assessment of the effects of water level fluctuations on cultural resources has never been conducted. Minimal effects are anticipated under Alternative A in the Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in effects to cultural resources depending upon the location-specific conditions and construction methods used for each project. Changes could occur during construction of future projects including Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures could reduce these effects; although, in many cases, the effects would remain substantial and unavoidable. For example, effects to cultural and historical resources due to disturbance or inundation were identified as substantial and unavoidable in Shasta Lake Water Resources Investigation Preliminary Draft EIS; Suisun Marsh Habitat Management, Preservation, and Restoration Plan EIS/EIR; North Delta Flood Control and Ecosystem Restoration Project EIR; and Dutch Slough Tidal Marsh Restoration Project EIR. Because it is not possible to predict all future effects to cultural resources within the Extended Study Area and

Secondary Study Area, and because implementation of Alternative A would potentially result in substantial and unavoidable effects in the Primary Study Area (as described below); implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 18 Cultural Resources, without mitigation, construction and operation of the proposed Project facilities under Alternative A would result in potentially substantial effects to cultural resources due to construction and operation activities. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.13.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources in the Primary Study Area under Alternative B would be similar to effects under Alternative A. Without mitigation, construction and operation of the proposed Project facilities under Alternative B would result in potentially substantial effects to cultural resources. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative B could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.13.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 18 Cultural Resources, effects to cultural resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and

Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and implementation of Alternative A and these future projects could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects to cultural resources in the Primary Study Area under Alternative C would be similar to effects under Alternative A. As described in Chapter 18 Chapter 18 Cultural Resources, without mitigation construction and operation of the proposed Project facilities under Alternative B would result in potentially substantial effects to cultural resources. Mitigation measures would reduce some of the effects. However, potential effects to historic resources and traditional cultural properties could remain substantial and unavoidable. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. However, because some of the effects could be substantial and unavoidable, implementation of Alternative C could result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to cultural resources in the Primary Study Area.

35.4.14 Indian Trust Assets

For the proposed Project, adverse effects to an Indian Trust Asset (ITA) are caused by direct changes to the ITA conditions or indirect changes to current activities within an ITA. As described in Chapter 19 Indian Trust Assets, there would be no effects under the No Project/No Action Alternative as compared to Existing Conditions in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas.

Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs.

35.4.14.1 Alternative A

As described in Chapter 19 Indian Trust Assets, implementation of Alternative A would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.14.2 Alternative B

As described in Chapter 19 Indian Trust Assets, implementation of Alternative B would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.14.3 Alternative C

As described in Chapter 19 Indian Trust Assets, implementation of Alternative C would result in no effects as compared to the No Project/No Action Alternative in the Extended Study Area, Secondary Study Area, or Primary Study Area because there are no ITAs within the vicinities of these study areas. Future projects evaluated in the cumulative effects analysis generally are not located in the vicinity of ITAs. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to ITAs in the Extended Study Area, Secondary Study Area, or Primary Study Area.

35.4.15 Land Use

Changes to land use in the Central Valley occurs as agricultural lands and open space are converted to other uses. Generally, land use conversion is associated with development of municipal and industrial land uses which require changes to existing general plans and land use designations. Land use conversions can result in loss of agricultural lands depending upon the historical land use.

As described in Chapter 20 Land Use, the No Project/No Action Alternative would result in no effects or minimal effects to land uses as compared to Existing Conditions.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect land uses in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in land use conversions within the Primary Study Area.

35.4.15.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, Alternative A would not result in substantial changes to land uses in the Extended Study Area and Secondary Study Area because CVP and SWP water deliveries would range from a minor decrease to a slight increase as compared to Existing Conditions, and would increase slightly as compared to the No Project/No Action Alternative. The place of use of this water would remain within the areas designated by the SWRCB for the CVP and SWP water rights. Therefore, no changes in land uses would occur due to changes in CVP and SWP water supply deliveries that would occur under Alternative A as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally would not result in a change in land use for the same reasons that are described above for Alternative A.

Implementation of water supply and ecosystem restoration projects would result in changes in land use. Future projects considered in the cumulative effects analysis that could contribute to changes in land use include the implementation of CVPIA and CALFED objectives; Delta Plan; Regional Advanced Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands Project; North Bay Aqueduct Alternative Intake Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; Trinity River Restoration Program; Clear Creek

Fisheries Habitat Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-Species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Future projects that result in changes or inundation of vegetation could result in substantial effects. Mitigation measures, including preservation and/or restoration of other agricultural lands and placement of the ecosystem restoration areas to avoid physically dividing communities could reduce the effects. Avoidance of adverse effects is not always feasible. For example, the San Joaquin River Restoration Program EIS/EIR and the Shasta Lake Water Resources Investigation identified changes in some land uses and loss of agricultural lands to be substantial and unavoidable.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Implementation of Alternative A could cause potentially substantial effects on land uses, especially agricultural resources, in the Primary Study Area due to construction of the proposed Project facilities. As described in Chapter 20 Land Use, mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable. In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or additional operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative A, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.15.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, in the Primary Study Area under Alternative B would be similar to those described for Alternative A. Implementation of Alternative B could cause potentially substantial effects on land uses, including agricultural resources, in the Primary Study Area at construction locations. Mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative B, implementation of Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.15.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 20 Land Use, effects on land uses, including agricultural resources, due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Extended Study Area and Secondary Study Area.

Primary Study Area

Effects on land uses, including agricultural resources, in the Primary Study Area under Alternative C would be similar to those described for Alternative A. Implementation of Alternative C could cause potentially substantial effects on land uses, including agricultural resources, in the Primary Study Area at construction locations. As described in Chapter 20 Land Use, mitigation measures would reduce some of the effects, but some conflicts or incompatibilities with existing and designated land uses and existing zoning for agricultural and forest land use, as well as the conversion of lands that have Williamson Act contracts, could remain substantial and unavoidable. In addition, the physical division of the community of Sites caused by inundation of the lands within the proposed Sites Reservoir would result in a substantial and unavoidable effect. None of the future projects evaluated in the cumulative effects analysis would result in additional construction or operation and maintenance activities within the Primary Study Area. However, due to the potentially substantial effects that would occur under Alternative C, implementation of Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on land uses, including agricultural resources, in the Primary Study Area.

35.4.16 Recreation Resources

Recreation resources that could be affected by operation of the proposed Project exist throughout the Extended Study Area and Secondary Study Area. As described in Chapter 21 Recreation Resources, the

No Project/No Action Alternative would result in no effects, potentially beneficial effects, or minimal effects to recreation resources as compared to Existing Conditions in most locations. However, implementation of the No Project/ No Action Alternative could result in changes to the amount of water stored in CVP and SWP reservoirs in the Extended Study Area and Secondary Study Area, which could result in a potentially substantial effect to recreation use levels. If CVP and/or SWP exports decrease, water stored in those reservoirs also may decrease to levels that could reduce the ability to use the reservoir for boating, swimming, and fishing. Surface water elevations in Lake Oroville and Folsom Lake and surface water flows in the American River would be reduced more frequently, which would adversely affect recreational opportunities under the No Project/No Action Alternative as compared to Existing Conditions. These conditions would result in potentially substantial effects under the No Project/No Action Alternative.

Several factors associated with future projects evaluated in the cumulative effects analysis could affect recreation resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.16.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 21 Recreation Resources, Alternative A was developed to increase CVP and SWP reservoir storage elevations and stabilize flows in the downstream rivers, which would result in beneficial effects in most locations in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative. However, Alternative A would result in potentially substantial effects at San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake. Mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) could further reduce summer water storage elevations and flows in rivers downstream of the CVP and SWP reservoirs. These changes could result in substantial recreation effects at the reservoirs and streams located downstream of the reservoirs.

Implementation of ecosystem restoration projects could increase recreation opportunities if public access is provided. Future ecosystem projects considered in the cumulative effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Central Valley Vision; Butte County Regional Conservation Plan; Semitropic Water Storage District Delta Wetlands; Los Vaqueros Reservoir Expansion Phase II; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Clear Creek Mercury Abatement and Fisheries Restoration Project; Cottonwood Creek Non-Native Invasive Species Eradication Program; Mill Creek Riparian Assessment; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Implementation of Alternative A and these future projects could increase recreational opportunities.

Due to the potential for reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative A and the potential for reductions under future projects, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 21 Recreation Resources, implementation of Alternative A would result in no or minimal effects on recreation resources in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to recreation resources in the Primary Study Area.

35.4.16.2 Alternative B

Extended Study Area and Secondary Study Area

Effects on recreation resources due to implementation of Alternative B would be similar to those under implementation of Alternative A in the Extended Study Area and Secondary Study Area. Alternative B would result in potentially substantial effects in San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake. Mitigation measures would reduce the effects. The cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Due to the potential for reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative B and the potential for reductions under future projects, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects on recreation resources in the Primary Study Area under Alternative B would be the same as under Alternative A. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Primary Study Area.

35.4.16.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 21 Recreation Resources, effects on recreation resources due to implementation of Alternative C would result in potentially substantial effects at San Luis Reservoir as compared to the No Project/No Action Alternative due to more frequent occurrence of low water storage elevations that would reduce the availability of the existing campground water intake and the existing boat ramp. Mitigation measures would reduce the effects. The cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Due to the potential for future reductions in reservoir water surface elevations in San Luis Reservoir and downstream flows during summer months on the American River under Alternative C and the potential for reductions under future projects, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Effects on recreation resources in the Primary Study Area under Alternative C would be the same as under Alternative A. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on recreation resources in the Primary Study Area.

35.4.17 Socioeconomics

Adverse effects to socioeconomic conditions are caused by changes in regional economic conditions, including effects on population and housing, effects on local government fiscal conditions, recreation economics, agricultural economics, and municipal and industrial water use economics. As described in Chapter 22 Socioeconomics, the No Project/No Action Alternative would result in no effects to socioeconomic conditions as compared to Existing Conditions.

Future projects evaluated in the cumulative effects analysis could affect socioeconomic conditions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.17.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 22 Socioeconomics, under Alternative A, improved CVP and SWP water supply reliability in the Extended Study Area and Secondary Study Area could result in reduced use of groundwater that either could be more expensive to use than CVP and SWP water supplies and/or result in less agricultural production than CVP and SWP water supplies. These conditions would result in minimal effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation (including the SWRCB Bay-Delta Water Quality Plan Update, Bay Delta Conservation Plan, NMFS recovery plan for salmonids, USFWS recovery plan of delta smelt, and Shasta Lake Water Resources Investigation) generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability would result in reduced use of groundwater in those areas which could result in no or minimal effects to socioeconomic conditions as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of water supply and ecosystem restoration projects also could affect socioeconomic conditions either by reducing agricultural productivity if agricultural lands are converted, or increasing recreation economic activity for visitors at the restoration locations or locations with increased waterfowl and other bird populations that use the restored ecosystem. Future projects considered in the cumulative effects analysis that could contribute to improved recreation resource conditions include the implementation of CVPIA and CALFED objectives; Delta Plan; California Aquatic Invasive Species Rapid Response Plan; Regional Advanced Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; Central Valley RWQCB Irrigated Lands Regulatory Program; CV-SALTS; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Cache Slough Complex Restoration; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures, such as avoidance of highly productive agricultural lands for ecosystem restoration could reduce the effects. However, in some cases, the effect could be substantial and unavoidable.

Although potentially substantial and unavoidable effects to socioeconomic conditions could occur under future projects, Alternative A would not result in similar effects. Therefore, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomics in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 22 Socioeconomics, Alternative A would result in increased economic activity due to land acquisition within the Primary Study Area, increases in employment and income during construction and operation of the proposed Project, and increases in recreation expenditures associated with increased recreational opportunities. Alternative A would also result in decreased property tax receipts in Glenn and Colusa counties, but these losses would not result in substantial effects to the regional economy. Implementation of Alternative A would result in substantial loss of prime agricultural land in the Primary Study Area, but compensation to property owners would reduce this effect. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, or projects that would change economic conditions within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to socioeconomic conditions in the Primary Study Area.

35.4.17.2 Alternative B

As described in Chapter 22 Socioeconomics, socioeconomic effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomic conditions in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.17.3 Alternative C

As described in Chapter 22 Socioeconomics, socioeconomic effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on socioeconomic conditions in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.18 Environmental Justice

Disproportional effects on minority or low-income populations are caused by changes in the physical, biological, and human environment. As described in Chapter 23 Environmental Justice, the potential for disproportional effects on minority or low-income populations under the No Project/No Action Alternative would be similar to Existing Conditions and result in no effects.

Future projects evaluated in the cumulative effects analysis could affect minority or low-income populations in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in changes within the Primary Study Area.

35.4.18.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 23 Environmental Justice, under Alternative A, improved CVP and SWP water supply reliability in the Extended Study Area and Secondary Study Area would result in no effects to minority or low-income populations as compared to Existing Conditions and the No Project/No Action Alternative.

Projects considered under the cumulative effects assessment that could result in changes in CVP and SWP operation include those identified in Table 35-1 for botanical resources, cultural resources, land use, recreation resources, air quality, and visual resources. These projects generally are being developed to either provide increased water supply reliability of historic water deliveries or increase water supply availability. Increased CVP and SWP water supply availability could result in improved socioeconomic conditions which would result in no or minimal effects to minority or low-income populations as compared to Existing Conditions and the No Project/No Action Alternative.

Ecosystem restoration projects generally are not located on or adjacent to lands with communities to avoid future conflicts with re-established wildlife populations. Therefore, implementation of ecosystem restoration projects is anticipated to result in no or minimal effects to minority or low-income populations.

Because Alternative A and the future projects would not result in substantial adverse effects to minority or low-income populations, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 23 Environmental Justice, implementation of Alternative A would result in no or minimal effects on minority or low-income populations in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities and therefore would not affect minority or low-income populations within the Primary Study Area. Implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations in the Primary Study Area.

35.4.18.2 Alternative B

As described in Chapter 23 Environmental Justice, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations.

35.4.18.3 Alternative C

As described in Chapter 23 Environmental Justice, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to minority or low-income populations.

35.4.19 Air Quality

For the proposed Project, changes in air quality could occur during construction and operations. During proposed Project construction, vehicle emissions and dust could result in total volume of pollutants that exceed objectives in adopted air quality management plans, exceed criteria in the adopted plans, or result in a cumulatively considerable net increase in nonattainment pollutants. During proposed Project operation, the primary activity that could affect air quality would be power generation.

As described in Chapter 24 Air Quality, air quality under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no or minimal effects on air quality under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to air quality in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area; however, air quality in the Primary Study Area would be influenced by air quality in the Secondary Study Area.

35.4.19.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, implementation of Alternative A would result in either no effects or minimal effects to air quality in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to air quality depending upon the location-specific conditions and construction methods used for each project. Changes to air quality in the Secondary Study Area could occur during construction of future projects including the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Clear Creek Fisheries Habitat Restoration Program; Mainstem Sacramento River Gravel Augmentation Program; Cottonwood Creek Geomorphological Analysis and Sediment Budget; Deer Creek Irrigation District Dam Fish Passage Improvement and Flow Enhancement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, air quality effects that would occur during construction were identified to be substantial and unavoidable for projects evaluated in the Shasta Lake Water Resources Investigation Preliminary Draft EIS, San Joaquin River Restoration Program EIS/EIR, and North Delta Flood Control and Ecosystem Restoration Project.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative A would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

Due to the potential for substantial and unavoidable effects during construction under Alternative A and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.19.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, effects on air quality due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative B would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable. Due to the potential for substantial and unavoidable effects during construction under Alternative B and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.19.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 24 Air Quality, effects on air quality due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative C would result in potentially substantial effects to air quality. Mitigation measures would reduce the effects during operation. However, effects during construction would remain substantial and unavoidable. Due to the potential for substantial and unavoidable effects during construction under Alternative C and future projects in the Secondary Study Area which could affect air quality in the Primary Study Area, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on air quality in the Primary Study Area.

35.4.20 Climate Change and Greenhouse Gas Emissions

For the proposed Project, changes in greenhouse gas emissions (GHG emissions) could occur during construction and operation due to direct GHG emissions or indirect GHG emissions from pumping and power generation. Potential for an increase or reduction in GHG emissions from open water surfaces was not evaluated in detail in Chapter 25 Climate Change and Greenhouse Gas Emissions, due to limited availability of protocol, guidance, and tools for the analysis.

Under the No Project/No Action Alternative, no proposed Project facilities would be constructed or operated, and no direct construction or operations activities with related GHG emissions would occur as compared to Existing Conditions. As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, there would be no GHG emissions effects under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to GHG emissions in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, or other changes within the Primary Study Area that would result in changes in GHG emissions.

35.4.20.1 Alternative A

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, implementation of Alternative A would result in no effects or minimal effects from direct GHG emissions during construction and operation of the proposed Project. Alternative A also would result in minimal effects from indirect GHG emission caused by electricity generation for operation of SWP facilities because the projected reduction in GHG emissions for SWP facilities also would provide adequate reductions for the portion of the proposed Project that would serve the SWP or its water users.

Operation of facilities under Alternative A would require a small increase in electricity usage to operate the CVP and would consequently reduce supply of GHG-emissions-free electricity available to sell to California electricity users. Because it is unknown which type of power source would be used to substitute for the lost power, these effects would be potentially substantial and unavoidable.

Implementation of projects considered under the cumulative effects assessment could result in changes to GHG emissions depending upon specific energy demands and construction and operation methods for each project. In general, mitigation measures can be implemented to minimize GHG emissions during construction for future projects. However, GHG emissions would increase to meet future increases in electricity demand to support future projects. Increased GHG emissions from power generation could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Restoration; and San Joaquin River Restoration Program. Operation of future facilities would result in potentially substantial effects to GHG emissions because it is unknown which type of power source would be used to provide the additional electricity for these projects. Therefore, these effects are considered to be substantial and unavoidable.

Because Alternative A would result in potentially substantial and unavoidable effects and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.20.2 Alternative B

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, effects on GHG emissions due to implementation of Alternative B would be similar to those described for Alternative A. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.20.3 Alternative C

As described in Chapter 25 Climate Change and Greenhouse Gas Emissions, effects on GHG emissions due to implementation of Alternative C would be similar to those described for Alternative A. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on GHG emissions.

35.4.21 Navigation, Transportation, and Traffic

For the proposed Project, effects to navigation, transportation, and traffic could occur during construction and operation. Construction activities along the navigation channels and roadways and construction traffic could result in substantial effects. During operation, recreation-related traffic could result in substantial effects.

As described in Chapter 26 Navigation, Transportation, and Traffic, effects to navigation, transportation, and traffic under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects to navigation, transportation, and traffic under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to navigation, transportation, and traffic in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.21.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, implementation of Alternative A would result in either no effects or minimal effects to navigation, transportation, and traffic in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to transportation and traffic depending upon the location-specific conditions and construction methods used for each project. Changes to transportation and traffic in the Secondary Study Area could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation, Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project, San Luis Reservoir Low Point Improvement Project; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Changes to navigation would be limited to local effects on boat traffic during gravel placement or levee construction. Mitigation measures would be available to reduce potential effects.

Because Alternative A and the future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, implementation of Alternative A would result in minimal effects to navigation in the Primary Study Area, but potentially substantial effects to transportation and traffic during construction due to roadway hazards or road damage due to oversized or overweight construction vehicles. Operation of the proposed recreation areas and the associated recreational traffic would result in potentially substantial effects to traffic during the summer months. Mitigation measures, such as development of a traffic control plan, would reduce the effects during construction and operations.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.21.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to transportation and traffic in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.21.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic.

Primary Study Area

As described in Chapter 26 Navigation, Transportation, and Traffic, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to transportation and traffic in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to navigation, transportation, and traffic in the Primary Study Area.

35.4.22 Noise

For the proposed Project, effects to noise levels could occur during construction. Construction activities near houses and businesses could result in exposure of people to noise or groundborne vibrations.

As described in Chapter 27 Noise, noise levels under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects to noise levels under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could affect noise levels in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.22.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, implementation of Alternative A would result in no effects or minimal effects to noise levels in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to noise levels and groundborne vibrations depending upon the location-specific conditions and construction methods used for each project. Changes to noise levels and groundborne vibrations in the Secondary Study Area near houses, businesses, or communities could occur during construction of future projects including the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Trinity River Restoration Program; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects. However, in some cases, mitigation measures may not be available to reduce the effects. For example, noise levels would remain substantial and unavoidable during portions of the construction activities described in the San Joaquin River Restoration Program EIS/EIR.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, implementation of Alternative A would result in potentially substantial effects to noise levels during construction near houses, businesses, or communities, including along County Road 69 at the proposed North Road; at the railroad siphon location in Willows; at the Glenn-Colusa Irrigation District Canal headworks; along the proposed Delevan Pipeline corridor; at the proposed Delevan Pipeline Intake Facilities location, at the proposed Terminal Regulating Reservoir location; and near the proposed structure demolition locations. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative A and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.22.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to noise levels in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.22.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 27 Noise, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to noise levels in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to noise levels in the Primary Study Area.

35.4.23 Public Health and Environmental Hazards

For the proposed Project, effects to public health and environmental hazards could occur during construction and operation. Adverse effects to public health and environmental hazards are caused by creation of a public health or environmental health hazard, adverse effects to emergency response plan or evacuation plan, increased risk of wildland fires, and increased risk of exposure to mosquito or vector-borne diseases.

As described in Chapter 28 Public Health and Environmental Hazards, risks to public health and environmental hazards under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effect to public health and environmental hazards under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in effects to public health and environmental hazards in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.23.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, because there would be no direct Project-related construction or maintenance occurring in the Extended Study Area or in most of the Secondary Study Area, there would be no direct or indirect effects on public health related to hazardous materials as compared to Existing Conditions and the No Project/No Action Alternative. During the proposed pump installation at the Red Bluff Pumping Plant in the Secondary Study Area, there could be accidental releases of hazardous materials that would contaminate soil or degrade water quality. Mitigation measures would reduce the effects.

Implementation of projects considered under the cumulative effects assessment could result in changes to public health and environmental hazards due to use or storage of fuels, oils, grease, and lubricants at future project locations. Future projects could that could affect public health and environmental hazards include the Bay Delta Conservation Plan; Anadromous Fish Screen Program; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay

Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Iron Mountain Mine Superfund Site; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, implementation of Alternative A would result in potentially substantial effects to public health and environmental hazards during construction and operation due to use and storage of fuels, oils, grease, and lubricants, or from the presence of unreported hazardous spills or unlisted underground storage tanks. Potential effects also could occur due to road closure, detour, or traffic congestion during construction that would reduce emergency access or evacuation responses. Operation of the proposed recreation areas under Alternative A would result in increased traffic congestion during the recreation season and an increased need for emergency response or evacuation response providers; increased risk of wildland fire hazards; and increased risk of exposure to insect stings (bees, yellowjackets, and stinging ants), ticks with tick-borne diseases, rodents, flies, Giardia, Swimmer’s Itch, liver flukes, rattlesnakes, and poison oak. The presence of surface water in the reservoirs would increase the risk of mosquitoes and vector population and the public health hazard of vector-borne diseases. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.23.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. However, the larger size of the proposed Sites Reservoir associated with Alternative B could increase the risk of exposure to mosquitoes and several vectors. Without mitigation, Alternative B could cause potentially substantial effects related to public health and environmental hazards in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.23.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards.

Primary Study Area

As described in Chapter 28 Public Health and Environmental Hazards, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. However, the larger size of the proposed Sites Reservoir associated with Alternative B could increase the risk of exposure to mosquitoes and several vectors. Without mitigation, Alternative C could cause potentially substantial effects to public health and environmental hazards in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public health and environmental hazards in the Primary Study Area.

35.4.24 Public Services and Utilities

For the proposed Project, effects to public services and utilities could occur during construction and operation. Adverse effects to public services are caused by an increased demand for emergency response services or increased emergency response time that results in the need for new or physically altered facilities. Adverse effects to utilities are caused by disruption to utilities.

As described in Chapter 29 Public Services and Utilities, effects to public services and utilities under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effect to public services and utilities under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in effects to public services and utilities in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.24.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, implementation of Alternative A would result in no effects or minimal effects to public services and utilities as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment could result in changes to public services and utilities due to potential disruption to utilities during construction. Future projects that could result in changes to public services and utilities include the Bay Delta Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; El Dorado Irrigation District Folsom Lake Temperature Control Device; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; North Delta Flood Control and Ecosystem Restoration Project; Dutch Slough Tidal Marsh Project; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures would be available to reduce potential effects.

Because Alternative A and most future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, implementation of Alternative A would result in no effects or minimal effects to public services and the need to for new or altered facilities, but would result in potentially substantial effects to utilities during construction. Potential effects during construction could occur if utilities were disrupted during relocation of eight transmission towers from the inundation area of the proposed Holthouse Reservoir, or if any unidentified utilities are disrupted. Mitigation measures would reduce the effects.

None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.24.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative B would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative B could cause potentially substantial effects to utilities in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative B and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.24.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Extended Study Area and Secondary Study Area.

Primary Study Area

As described in Chapter 29 Public Services and Utilities, effects of implementation of Alternative C would be similar to those described for Alternative A in the Primary Study Area. Without mitigation, Alternative C could cause potentially substantial effects to utilities in the Primary Study Area. Mitigation measures would reduce the effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area. Therefore, implementation of Alternative C and these future projects would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to public services and utilities in the Primary Study Area.

35.4.25 Visual Resources

For the proposed Project, changes in visual resources could occur during construction and operation. During construction, the presence of construction equipment, light and glare from construction lighting and construction vehicles, and disruption of agricultural activities along the valley floor near construction locations would affect visual resources. During operation, light and glare would occur from several sources and changes in the visual landscape would affect visual resources.

As described in Chapter 30 Visual Resources, visual resources under the No Project/No Action Alternative would be similar to Existing Conditions. Therefore, there would be no effects or minimal effects on visual resources under the No Project/No Action Alternative.

Future projects evaluated in the cumulative effects analysis could result in changes to visual resources in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

35.4.25.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, implementation of Alternative A would result in either no effects or minimal effects to visual resources in the Extended Study Area and Secondary Study Area as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects analysis could result in changes to visual resources depending upon the location-specific conditions and construction methods used for each project. Changes to visual resources in the Secondary Study Area could occur during construction or implementation of future projects including implementation of CVPIA and CALFED objectives; Bay Delta Conservation Plan; Delta Plan; Anadromous Fish Screen Program; Regional Advance Mitigation Program; Central Valley Vision; County of Colusa 2030 General Plan; Butte County Regional Conservation Plan; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; South Delta Temporary Barriers Operations; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; San Luis Reservoir Low Point Improvement Project; Trinity River Restoration Program; Yolo County Habitat/Natural Community Conservation Plan; Yolo Bypass Wildlife Area Land Management Plan; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan; Cache Slough Complex Restoration; North Delta Flood Control and Ecosystem Restoration Project; Fish Screen Project at Sherman and Twitchell Islands; Dutch Slough Tidal Marsh Project; Franks Tract Project; Solano County Multi-species Habitat Conservation Plan; Suisun Marsh Habitat Management, Preservation, and Restoration Plan; and San Joaquin River Restoration Program. Mitigation measures generally would be available to reduce potential effects. In some cases, the effects could remain substantial and unavoidable. For example, visual effects were identified to be substantial and unavoidable for projects evaluated in the Shasta Lake Water Resources Investigation Preliminary Draft EIS and the San Joaquin River Restoration Program EIS/EIR.

Because Alternative A would result in potentially substantial and unavoidable effects in the Primary Study Area in the Sacramento Valley floor (as described below) and some future projects also could result in substantial and unavoidable effects, implementation of Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and the Secondary Study Area.

Primary Study Area

Construction and operation of facilities under Alternative A would result in potentially substantial effects to visual resources. In many cases, mitigation measures would reduce the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the proposed Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans, resulting in substantial and unavoidable effects. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities within the Primary Study Area.

Due to the potential for substantial and unavoidable effects under Alternative A and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative A would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.25.2 Alternative B

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, effects on visual resources due to implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative B would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of proposed Project facilities under Alternative B would result in potentially substantial effects to visual resources, similar to the effects described under Alternative A. However, the extent of the effects due to glare from the water surface of the proposed Sites Reservoir would be greater under Alternative B because the reservoir would be larger than under Alternative A. Mitigation measures would reduce many of the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the proposed Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans, resulting in substantial and unavoidable effects. Due to the potential for substantial and unavoidable effects under Alternative B and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative B would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.25.3 Alternative C

Extended Study Area and Secondary Study Area

As described in Chapter 30 Visual Resources, effects on visual resources due to implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area. The cumulative effects of Alternative C would therefore be similar to those described for Alternative A in the Extended Study Area and Secondary Study Area, and would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Extended Study Area and Secondary Study Area.

Primary Study Area

Construction and operation of facilities under Alternative C would result in potentially substantial effects to visual resources, similar to the effects described under Alternative A. However, the extent of the effects due to glare from the water surface of the proposed Sites Reservoir would be greater under Alternative C because the reservoir would be larger than under Alternative A. Mitigation measures would reduce many of the effects. However, substantial and unavoidable effects would occur due to glare from the water surface of the proposed Sites Reservoir; changes in the visual characteristic of the area from rural and undeveloped to an area with more infrastructure, such as the proposed South Bridge and connecting roadways; and change in views across the valley floor due to the six-foot high embankments of the Terminal Regulating Reservoir. The inundation area of the proposed Sites Reservoir would eliminate the large contiguous areas of grazing land that are protected by the goals and objectives of the Colusa County and Glenn County general plans, resulting in substantial and unavoidable effects. Due to the potential for substantial and unavoidable effects under Alternative C and from future projects in the Secondary Study Area which could affect visual resources in or near the Primary Study Area, Alternative C would result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on visual resources in the Primary Study Area.

35.4.26 Power Production and Energy

Adverse effects to power production and energy use are caused by wasteful or unnecessary consumption of energy and reduction of the generation of renewable energy. As described in Chapter 31 Power Production and Energy, power production and energy use under the No Project/No Action Alternative would be similar to Existing Conditions and result in no effects.

Future projects evaluated in the cumulative effects analysis could affect power production and energy in the Extended Study Area and the Secondary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in changes within the Primary Study Area.

35.4.26.1 Alternative A

Extended Study Area and Secondary Study Area

As described in Chapter 31 Power Production and Energy, implementation of Alternative A would not result in wasteful or unnecessary consumption of energy and would not result in reduction of the generation of renewable energy in the Extended Study Area and Secondary Study Area. Implementation of Alternative A would therefore result in no effects or minimal effects as compared to Existing Conditions and the No Project/No Action Alternative.

Implementation of projects considered under the cumulative effects assessment that could result in changes in increased energy use and/or changes in hydropower generation include the SWRCB Bay-Delta Water Quality Plan Update; Bay Delta Conservation Plan; NMFS recovery plan for salmonids; Increased Hydropower Generation Capacity at Lewiston Dam; Shasta Lake Water Resources Investigation; Woodland-Davis Water Supply Project; Semitropic Water Storage District Delta Wetlands; North Bay Aqueduct Alternative Intake; Bay Area Regional Desalination Project; Los Vaqueros Reservoir Expansion Phase II; Upper San Joaquin River Basin Storage Investigation; Grassland Bypass Project; CV-SALTS; San Luis Reservoir Low Point Improvement Project; and San Joaquin River Restoration Program. All of these projects are assumed to be designed to avoid wasteful or unnecessary consumption of energy. Implementation of the Shasta Lake Water Resources Investigation and San Joaquin River Basin Storage Investigation are being developed to avoid reduction in hydropower generation.

Because Alternative A and the future projects would not result in substantial adverse effects, Alternative A would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to power production and energy in the Extended Study Area and the Secondary Study Area.

Primary Study Area

As described in Chapter 31 Power Production and Energy, implementation of Alternative A would result in no effects or minimal effects to power production and energy in the Primary Study Area. None of the future projects evaluated in the cumulative effects analysis would result in construction or additional operation and maintenance activities, nor would they change c power production and energy within the Primary Study Area. Implementation of Alternative A and these future projects therefore would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect to power production and energy in the Primary Study Area.

35.4.26.2 Alternative B

As described in Chapter 31 Power Production and Energy, effects of implementation of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative B would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on power production and energy in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.4.26.3 Alternative C

As described in Chapter 31 Power Production and Energy, effects of implementation of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area. Therefore, the cumulative effects of Alternative C would be similar to those described for Alternative A in the Extended Study Area, Secondary Study Area and Primary Study Area, and would not result in a cumulatively considerable incremental contribution to an overall substantial cumulative adverse effect on power production and energy in the Extended Study Area, Secondary Study Area and Primary Study Area.

35.5 References

Council on Environmental Equality (CEQ). 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Memorandum. June.

Council on Environmental Equality (CEQ). 1997. Considering Cumulative Effects Under the National Environmental Policy Act. January.

U.S. Bureau of Reclamation (Reclamation). 2012. Reclamation's NEPA Handbook. February. Chapters 8-18. Available at http://www.usbr.gov/nepa/docs/NEPA_Handbook2012.pdf

36. Consultation and Coordination

36.1 Introduction

This chapter summarizes the public and agency involvement activities undertaken by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) to date for the North-of-the-Delta Offstream Storage Project (NODOS Project or proposed Project), which satisfy the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) requirements for public scoping and agency coordination and consultation. Chapter 39 EIR/EIS Distribution List presents the entities receiving the Notice of Availability of the Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS).

DWR and Reclamation continue to solicit input from these entities regarding the proposed Project by encouraging review of this DEIR/EIS.

36.2 Notice of Preparation and Notice of Intent

DWR and Reclamation notified interested parties of the scoping period and upcoming public scoping meetings through electronic and postal mailings and through publication of a Notice of Preparation (NOP) and Notice of Intent (NOI), consistent with CEQA and NEPA, respectively. Copies of the NOP and NOI are included in Appendix 36A.

DWR filed the NOP with the State Clearinghouse on November 5, 2001, and Reclamation published the NOI in the *Federal Register* on November 9, 2001. The NOP and NOI notified the public of the NODOS Project proposal, announced the dates and locations of public meetings, and solicited public comments to help guide development of the pending DEIR/EIS, pursuant to CEQA and NEPA, respectively. Public notifications were also made through direct mailings to local landowners in and near the proposed Sites and Newville reservoir locations, and by advertisements in four local newspapers prior to the public meetings. In addition, a news release was placed on the DWR and Reclamation website homepages.

36.3 Public Scoping

Public scoping activities were conducted in compliance with both CEQA and NEPA requirements. The scoping process aided in identifying the range of actions, alternatives, mitigation measures, and potential effects to be analyzed in depth in the DEIR/EIS.

At the scoping meetings and during the scoping comment period, the public was invited to submit written comments regarding the scope, content, and format of the environmental document by mail, fax, or email to representatives at DWR and Reclamation.

36.3.1 Scoping Meetings

During the public scoping process, DWR and Reclamation conducted three formal scoping meetings to seek public input and comments prior to the preparation of the DEIR/EIS. The dates and locations of the meetings are listed in Table 36-1. In addition, DWR and Reclamation held a scoping meeting with the Native American tribes.

Table 36-1
NODOS Project Public Scoping Meetings

Sacramento, CA Date: Tuesday, January 8, 2002 Time: 1:00 p.m. to 4:00 p.m. Location: Department of Water Resources, Bonderson Building, Public Hearing Room – 1st Floor Address: 901 P Street, Sacramento, CA	**Maxwell, CA** Date: Wednesday, January 9, 2002 Time: 6:00 p.m. to 9:00 p.m. Location: Maxwell Inn Address: 81 Oak Street, Maxwell, CA
Fresno, CA Date: Tuesday, January 15, 2002 Time: 6:00 p.m. to 9:00 p.m. Location: Piccadilly Inn – University Address: 4961 N. Cedar Avenue, Fresno, CA	**Williams, CA** Date: Wednesday, January 23, 2002 6:00 to 9:00 p.m. Location: Cortina Indian Rancheria Office Address: 570 Sixth Street, Williams, CA

The format for each public meeting was identical. The meetings began with DWR and Reclamation representatives giving a 30-minute Powerpoint presentation that described the water resources challenges in the Sacramento River region, the CALFED[1] Bay-Delta Program (CALFED) and the CALFED storage element[2], objectives of the NODOS Project, potential alternatives, and opportunities for public participation. Following the presentation, 60 minutes were allotted for public comments on the scope and content of the NODOS DEIR/EIS. Comments were accepted in writing, and oral comments were recorded by a court reporter.

36.3.2 Scoping Report

A Scoping Report, which was prepared at the end of the scoping meetings and comment period, is included in Appendix 36A. The Scoping Report outlines the process and outcomes of the scoping meetings. It includes a summary of all comments received during the scoping process, both written and oral, and appendixes that include the NOP and NOI, meeting announcements, newspaper ads announcing the scoping meetings, the Powerpoint presentation used during the scoping meetings, transcripts of the scoping meetings, and an initial outline of the DEIR/EIS.

36.4 Consultation

Since late 2001, DWR and Reclamation have met with stakeholders, interested parties, and State and federal regulatory agencies. The purpose of these meetings was to provide briefings about the proposed Project and to seek input. These consultations assisted the lead agencies in determining the scope of the DEIR/EIS, identifying the range of alternatives and mitigation measures, and identifying potential environmental impacts. The consultation participants are described below.

36.4.1 Environmental Interests, County Boards of Supervisors, and Water Contractors

DWR and Reclamation provided briefings to stakeholder groups and interested parties between September 2003 and February 2004. The briefings included presentations and discussions regarding the planning objectives, the technical studies underway, preliminarily identified potential benefits and impacts, and the status of the proposed Project. Briefings were provided to the following groups:

- Bay-Area Environmental Water Caucus

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[1] CALFED is a cooperative interagency effort of State and federal agencies to develop and implement a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system.

[2] Storage is one of five program elements identified by CALFED to achieve the Water Supply Reliability objective. The other four program elements are conveyance, water transfers, water use efficiency, and the Environmental Water Account.

- Chico Environmental Caucus
- Colusa County Board of Supervisors
- Glenn County Board of Supervisors
- Sacramento River Conservation Area Forum
- San Luis and Delta-Mendota Water Authority
- State Water Contractors
- Tehama County Flood Control and Water Conservation District

36.4.2 Sacramento River Flow Regime Technical Advisory Group

At the request of the NODOS Project management team, the Sacramento River Flow Regime Technical Advisory Group (TAG) was formed in 2002 (Table 36-2). The TAG held meetings regularly from 2002 through 2004. The TAG was asked to consider the flow regime of the upper Sacramento River. Specifically, the TAG was asked to help identify potential NODOS Project flow regime impacts and benefits, and to improve the overall understanding of the flow regime of the Sacramento River and related ecosystem processes. In addition, the TAG provided ideas and identified issues to be addressed during NODOS Project studies. The TAG consisted of the NODOS Project study team, technical staff members from other State and federal agencies, technical staff members from various environmental interest groups, and university researchers. With input from the TAG, the NODOS Project study team prepared the administrative draft *Sacramento River Flow Regime Status Report* (Reclamation and DWR, 2007). The report describes the historic changes in the Sacramento River flow regime and presents preliminary concepts that might improve the habitat and ecological processes of the Sacramento River, both with and without an implemented NODOS Project. The report also documents the need for additional studies related to flow regime and ecosystem processes.

Table 36-2
Sacramento River Flow Regime Technical Advisory Group Participants

Affiliation	Participant(s)
California Bay-Delta Authority - Ecosystem Restoration Program	Dan Castleberry Rebecca Fris
California Department of Fish and Game	Dave Zezulak Fred Jurick Harry Rectenwald Paul Ward Randy Benthin Steve Turek
California Department of Water Resources	Aric Lester Brian Heiland Don Rasmussen Gail Kuenster Jerome Ripperda Jim Wieking Koll Buer Sean Sou Shawn Pike Stacy Cepello Steve Roberts Terry Mills Tracy Middleton
CH2M HILL	Dick Daniel Gwen Buchholz

Table 36-2
Sacramento River Flow Regime Technical Advisory Group Participants

Affiliation	Participant(s)
Friends of the River	Steve Evans
Metropolitan Water District of Southern California	David Fullerton
National Oceanic Atmospheric Administration Fisheries	John Baker
Natural Heritage Institute	David Purkey John Wise
Orland Water User's Association	Rick Massa
Sacramento River Conservation Area Forum	Burt Bundy
Sacramento River Preservation Trust	John Merz
State Water Contractors	Laura King-Moon
Tehama-Colusa Canal Authority	Mike Hagman
The Bay Institute	Gary Bobker Peter Vorster Tina Swanson
The Nature Conservancy	Marlyce Myers Mike Roberts Peter Yolles Sam Lawson
U.S. Army Corps of Engineers	Alicia Kirchner Gary Lemon
U.S. Bureau of Reclamation	John Hannon Laura Allen Mike Tansey Tom Patton
U.S. Fish and Wildlife Service	Matt Brown
University of California Davis	Eric Larsen Steve Greco Cindy Lowney (formerly associated with UCD)

36.4.3 California Bay-Delta Public Advisory Committee, Water Supply Subcommittee Briefings

DWR and Reclamation briefed the CALFED Water Supply Subcommittee regularly about the planning and status of the NODOS Project, modeling tool development, and technical findings. These briefings were intended to inform the Water Supply Subcommittee members so that the Subcommittee could then inform the California Bay-Delta Public Advisory Committee. The Water Supply Subcommittee meetings were open to the public. Reclamation and DWR staff members, staff members from other State and federal agencies, environmental interest groups, water contractors, and members of the public typically attended the meetings. Briefings to the Water Supply Subcommittee ended in 2007. The Water Supply Subcommittee subsequently ceased to exist.

36.4.4 Common Assumptions Stakeholder Technical Workgroup

Common Assumptions was an effort by DWR, Reclamation, and CALFED to develop consistent methodologies and assumptions for the surface storage investigations through the development of a "common model" package. At the request of the Water Supply Subcommittee in October 2003, a technical stakeholder workgroup, consisting of technical participants from environmental interest groups and water user groups, was formed to help provide informed feedback to Water Supply Subcommittee members about the Common Assumptions activities relating to the development of the "common model" package. The "common model" package is a suite of models that includes hydrologic, hydraulic, hydrodynamic, water quality, temperature, fisheries, and economics models that were adapted to represent the NEPA and CEQA baseline conditions for the NODOS Project and all other CALFED surface-water storage and conveyance investigations. The NODOS Project study team and the Common Assumptions technical team held five meetings with the technical workgroup to provide updates and technical information about Common Assumptions activities.

36.4.5 Landowner Meetings

DWR and Reclamation held numerous meetings with landowners in and near the proposed Sites Reservoir location to brief them about the proposed Project features and the status of the proposed Project. These meetings were organized by the landowners group, and the agencies were invited periodically to attend and address specific issues. Landowners used these opportunities to voice issues of concern and provide input to DWR and Reclamation. The meetings were held in the town of Sites on the following dates:

- July 30, 2001
- August 27, 2001
- October 2002
- December 5, 2002

36.4.6 Study Area Tours

DWR conducted tours of the proposed Sites Reservoir location for agency staff, the press, and interested stakeholders, when requested. During each tour, DWR staff provided updates regarding the Project status and technical findings. The tours provided interested parties with firsthand views of the area and the locations of proposed facilities. DWR staff continued to conduct tours of the proposed Sites Reservoir location during the preparation of this DEIR/EIS. The Water Education Foundation (WEF) has included tours of the proposed Sites Reservoir location in its Northern California Tour itinerary since 2001. The WEF's Northern California Tour stopped at the proposed Sites Reservoir location on the following dates:

- October 5, 2001
- October 4, 2002
- September 26, 2003
- September 17, 2004
- September 23, 2005
- September 15, 2006
- September14, 2007
- September 12, 2008
- October 9, 2009
- September 24, 2010
- October 14, 2011
- October 19, 2012
- October 18, 2013

36.5 Coordination

The following sections describe coordination efforts with local water interests, counties, and other State and federal agencies throughout the environmental documentation process.

36.5.1 Sites Memorandum of Understanding

The CALFED Record of Decision (ROD) directed DWR and Reclamation to develop a joint planning program through a Memorandum of Understanding (MOU) with local water interests, counties, and State and federal agencies to carry out the NODOS Project. Beginning in November 2000, two State, and three federal agencies, along with several local entities, signed the MOU. Other local entities subsequently signed the MOU. The MOU signatories are shown in Table 36-3. DWR and Reclamation held coordination meetings with the MOU parties from 2001 to 2005.

Table 36-3
Sites MOU Signatories

State Agencies	Local agencies
California Department of Fish and Game* California Department of Water Resources **Federal Agencies** U.S. Bureau of Reclamation, Mid-Pacific Region U.S. Fish and Wildlife Service Western Area Power Administration	County of Colusa Colusa Drain Mutual Water Company Glenn-Colusa Irrigation District Maxwell Irrigation District Natomas Mutual Water Company Orland Unit Water User's Association Princeton Cordora Glenn Irrigation District Provident Irrigation District Reclamation District 108 Sutter Mutual Water Company Tehama-Colusa Canal Authority Yolo County Flood Control and Water Conservation District

*At the time that the MOU was signed, the agency was known as the "California Department of Fish and Game". As of January 1, 2013, its name has changed to the "California Department of Fish and Wildlife".

36.5.2 Sites Project Joint Powers Authority

On November 4, 2009, the California Legislature passed, and then-Governor Arnold Schwarzenegger signed into law, a far-reaching legislative package regarding water known as the 2009 Comprehensive Water Package. The Package included four policy bills and a water bond measure aimed at improving water supply reliability and restoring the Sacramento-San Joaquin Delta ecosystem. Senate Bill 7X 2 (SB 7X 2) proposed an $11.14 billion general obligation bond to provide funding for water infrastructure and projects to address ecosystem and water supply reliability. SB 7X 2 allows the formation of local joint powers authorities by irrigation districts and other local water districts and local governments within the applicable hydrologic region to design, acquire, and construct those projects.

Consistent with SB 7X 2, the Sites Project Joint Powers Authority (Sites JPA) was formed in August 2010 to help design, acquire, construct, manage, govern, and operate the NODOS Project to provide local, regional, and Statewide public benefits, improve the State's water system, and enhance the ecosystem. The Sites JPA is comprised of the Glenn-Colusa Irrigation District (GCID), Reclamation District 108, Tehama-Colusa Canal Authority (TCCA), Maxwell Irrigation District, County of Glenn, County of Colusa, and Yolo County Flood Control and Water Conservation District. DWR is a non-voting ex-officio member of the Sites JPA.

DWR and Reclamation have attended many of the monthly Sites JPA meetings since September 2010, at the invitation of the JPA. These meetings are open to the public, and meeting announcements and agendas are posted on the Sites JPA website (http://www.sitesjpa.net/Agendas.html). In addition, Sites JPA representatives have been attending the NODOS Project cooperating agencies' meetings.

36.5.3 Cooperating Agencies

Pursuant to NEPA[3], a cooperating agency may be any agency other than the lead agency that has jurisdiction by law or special expertise, especially with respect to the environmental impacts expected to result from a proposal. An agency has “jurisdiction by law” if it has the authority to approve, veto, or finance all or part of the proposal[4]. An agency has “special expertise” if it has statutory responsibility, agency mission, or related program experience with regard to a proposal[5]. A lead agency must request the participation of cooperating agencies as early as possible in the NEPA process, use the environmental analyses and proposals prepared by cooperating agencies as much as possible, and meet with cooperating agencies at their request[6].

Cooperating agencies have been encouraged to take an active part in the development of this DEIR/EIS. In early 2011, Reclamation (the NEPA lead agency for the NODOS Project) signed cooperating agency memorandums of agreement (MOAs) with the following entities for the NODOS Project:

- Bureau of Indian Affairs
- Western Area Power Administration
- U.S. Army Corps of Engineers
- Colusa Indian Community Council
- Cortina Indian Rancheria
- Sites JPA

Since April 2011, DWR and Reclamation have held regular coordination meetings with the cooperating agencies to provide briefings and seek input regarding the NODOS Project.

36.5.4 Responsible Agencies

Pursuant to CEQA, responsible agencies are the public agencies (other than the lead agency) that have discretionary approval power over a project[7]. There has been ongoing coordination with the following applicable responsible agencies regarding the NODOS Project:

- California Department of Fish and Wildlife[8]
- State Water Resources Control Board
- Central Valley Regional Water Quality Control Board, Central Valley Region 1
- Tehama-Colusa Canal Authority
- Glenn-Colusa Irrigation District
- Sites JPA

36.5.5 Trustee Agencies

Pursuant to CEQA, trustee agencies are State agencies that have jurisdiction by law over natural resources affected by a project that are held in trust for the people of the State of California. Trustee agencies include:

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[3] 40 CFR 1508.5; 1501.6; Forty Questions No. 14(a), 14(b), 14(c).
[4] 40 CFR 1508.15.
[5] 40 CFR 1508.26.
[6] 40 CFR 1501.6(a).
[7] CEQA Guidelines Section 15381.
[8] Formerly known as the California Department of Fish and Game (i.e., prior to January 1, 2013).

- California Department of Fish and Wildlife[8] (CDFW) with regard to the fish and wildlife of the State, to designated rare or endangered native plants, and to game refuges, ecological reserves, and other areas administered by DFG
- California State Lands Commission with regard to State-owned sovereign lands, such as the beds of navigable waters and state school lands
- California Department of Parks and Recreation with regard to units of the State Park System
- University of California with regard to sites within the Natural Land and Water Reserves System[9]

There has been ongoing coordination with the applicable trustee agencies regarding the NODOS Project.

36.5.6 Native American Representatives

DWR and Reclamation have been coordinating with the following Native American Tribes:

- Colusa Indian Community Council
- Cortina Indian Rancheria
- Grindstone Indian Rancheria
- Paskenta Band of Nomlaki Indians

DWR and Reclamation have met with the four tribal representatives on an informal basis to provide updates regarding NODOS Project progress and to encourage input from the tribes about their issues of concern. In addition to conducting a tribal scoping meeting and one field tour of the proposed Sites Reservoir location and cultural resource sites, eight coordination meetings were held with the tribal representatives during the completion of the NODOS Initial Alternatives Information Report[10] (DWR and Reclamation, 2006). In 2004, Reclamation provided grant funding to the four tribes to develop appraisal-level tribal water resource studies. The studies appraised future water needs and availability, and evaluated whether the proposed Project would impair or enhance that water availability. With Reclamation’s grant funding, three of the four tribes completed the appraisal studies. The Cortina Indian Rancheria and its consultant completed a report titled “North of the Delta Off-Stream Storage Interim Report by Cortina Band of Wintu Indians, March 2010.” The Grindstone Indian Rancheria and its consultant completed three technical memoranda: Grindstone Creek Rancheria Background Information (November 19, 2010), Grindstone Rancheria Water Use (November 19, 2010), and Effects of NODOS Project on Grindstone Rancheria Water Rights (November 19, 2010). A confidential report titled, “North-of-the-Delta Offstream Storage Tribal Asset Study for the Colusa Indian Community Council, August 2011” was developed with funds provided by Reclamation. In addition, Reclamation completed an Engineering Technical Memorandum titled “Water Supply Conveyance Report, May 2011” for the Cortina Indian Rancheria.

Formal consultation between the tribes and Reclamation will be initiated when a preferred alternative has been identified and the Area of Potential Effects (APE) is defined and documented in consultation with the State Historic Preservation Office, pursuant to Section 106 of the National Historic Preservation Act.

[9] CEQA Guidelines Section 15386.

[10] The IAIR identified, discussed, and screened measures to address the problems and needs and introduced the development of potential initial alternatives for further consideration.

36.5.7 Environmental Coordination Advisory Team

DWR and Reclamation have participated in ongoing coordination and consultation meetings with the Environmental Coordination Advisory Team (ECAT). The ECAT consists of DWR, Reclamation, and other State and federal agencies, including CDFW, U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), Central Valley Regional Water Quality Control Board (CVRWQCB), U.S. Environmental Protection Agency (USEPA), and U.S. Army Corps of Engineers (USACE). DWR and Reclamation will continue to proactively engage these agencies throughout the NEPA, CEQA, and NODOS Project permitting processes. The focus of these coordination meetings is to discuss the scope and level of analysis for compliance with the Federal Endangered Species Act and California Endangered Species Act, Federal Water Pollution Control Act (commonly referred to as the Clean Water Act), Fish and Wildlife Coordination Act, and other regulatory requirements related to development of the NODOS Project DEIR/EIS and the 2011 North-of-the-Delta Offstream Storage Investigation Feasibility Report (Feasibility Report).

36.6 Draft EIR/EIS Public Review Process

In compliance with CEQA and NEPA review requirements, this DEIR/EIS is being circulated for public and agency review and comment for a 90-day period following the date when DWR files the Notice of Completion (NOC) with the Office of Planning and Research, State Clearinghouse; and the U.S. Environmental Protection Agency (USEPA) publishes the Notice of Availability (NOA) of Weekly Receipt of Environmental Impact Statement in the Federal Register. The DEIR/EIS is available for download from DWR's and Reclamation's websites at http://www.water.ca.gov/storage/northdelta/index.cfm and http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=139, respectively. In addition, printed copies of the DEIR/EIS are available at no cost at DWR and Reclamation offices, and are available for viewing at several libraries (Table 36-4).

Table 36-4
NODOS DEIR/EIS Locations of Availability for Printed Copies

Library Locations	DWR and Reclamation Locations
Sacramento Public Library 828 I Street Sacramento, CA 95814	California Department of Water Resources 901 P Street Sacramento, CA. 95814
Red Bluff Public Library 645 Madison Street Red Bluff, CA 96080	California Department of Water Resources Northern Region Office 2440 Main Street Red Bluff, CA 96080
Willows Public Library 201 North Lassen Street Willows, CA 95988	U.S. Bureau of Reclamation Mid-Pacific Regional Office Library 2800 Cottage Way, W-1825 Sacramento, CA 95825-1989
Maxwell Branch Library 340 Oak Street Maxwell, CA 95955	U.S. Department of the Interior Natural Resources Library 1849 C Street N.W., Main Interior Building Washington, DC 20240-0001

During the 90-day DEIR/EIS public and agency review period, public hearings will be held in the counties of Glenn, Colusa, and Sacramento, as well as in the Sacramento-San Joaquin Delta, to solicit public input. Written and oral comments will be accepted at these meetings.

Written comments (either by U.S. mail, fax, or email) will be accepted throughout the DEIR/EIS public and agency review period, but no later than 5:00 p.m. on XXXX. Written comments should be submitted to either of the following individuals:

Sean Sou
California Department of Water Resources
PO Box 942836
Sacramento, CA 94236-0001
sean.sou@water.ca.gov
Fax: (916) 651-9292

Sharon McHale
U.S. Bureau of Reclamation
2800 Cottage Way, MP-700
Sacramento CA. 95825
smchale@usbr.gov
Fax: (916) 978-5094

Reviewers of the DEIR/EIS should focus on the sufficiency of the document in identifying and analyzing possible impacts on the environment and ways in which the significant impacts of the proposed Project alternatives might be avoided or mitigated. Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate significant environmental impacts.

36.7 DEIR/EIS and Proposed Project/Proposed Action Approval Process

At the end of the 90-day DEIR/EIS public and agency review period, DWR and Reclamation will consider the comments received, and will prepare responses to the comments and errata (i.e., text and/or graphic changes to the DEIR/EIS), as needed. This response document, along with the DEIR/EIS, will constitute the Final EIR/EIS. The Final EIR/EIS will then be circulated in accordance with CEQA and NEPA requirements.

After the end of the Final EIR/EIS circulation period, DWR and Reclamation management will consider the Final EIR/EIS when deciding whether to certify the EIR, adopt the EIS, and approve one of the proposed Project alternatives. At the time that an alternative is being considered for approval, DWR will adopt written findings of fact for each significant impact that is identified in the Final EIR. The Final EIR/EIS and the alternative being considered will be formally presented to DWR's Director and Reclamation's Mid-Pacific Region Regional Director at meetings that will be held in Sacramento by DWR and Reclamation. The meetings will be open to the public, and the public may comment at the meetings.

Following the approval of one of the proposed Project alternatives (if that is the case), to document its decision, DWR will file a Notice of Determination (NOD) with the Office of Planning and Research, State Clearinghouse, and Reclamation will issue a Record of Decision (ROD) to the public (the DEIR/EIS Distribution List) and the *Federal Register*.

36.8 References

California Department of Water Resources and U.S. Bureau of Reclamation (DWR and Reclamation). 2006. North-of-the-Delta Offstream Storage Investigation Initial Alternatives Information Report. 253 p. May.

U.S. Bureau of Reclamation and California Department of Water Resources (Reclamation and DWR). 2007. Sacramento River Flow Regime Status Report. Administrative Draft. 202 p. April.

38. List of Preparers and Contributors

38.1 Introduction

This Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS) was prepared by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation). The following individuals led the effort from those agencies:

CEQA Lead Agency (DWR):

- Ajay Goyal (Principal Engineer, Water Resources)
- Sean Sou (Supervising Engineer, Water Resources)
- Jim Wieking (Supervising Engineer, Water Resources)

NEPA Lead Agency (Reclamation):

- Ron Ganzfried (Branch Chief)
- Sharon McHale (Project Manager)
- David Pritchett (Alternate Project Manager)

The following tables list the people who prepared various sections of the DEIR/EIS and/or background materials, or conducted reviews of materials for the DEIR/EIS. This chapter is consistent with the requirements set forth in NEPA and CEQA (40 CFR 1502.17 and Section 15129 of the State CEQA Guidelines), respectively.

38.2 State

Table 38-1 lists the staff from DWR who contributed to the preparation of this DEIR/EIS.

Table 38-1
California Department of Water Resources Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Dave Bogener	Environmental Program Manager	B.A. Natural Science; M.A. Wildlife Resource Management and Planning	33	Description of the Proposed Project/Proposed Action and Alternatives; Environmental Compliance and Permit Summary; Document Review
Amy Lyons	Senior Environmental Scientist (Specialist)	B.S. Biological Sciences; M.S. Biological Sciences	18	Alternatives Analysis, Terrestrial Biological Resources; Document Review
Ghassan Alqaser	Senior Engineer, Specialist	Ph.D. Civil Engineering, Hydraulics	30	Power Production and Energy, Power Optimization
David Arrate	Senior Engineer, Water Resources	B.S. Civil Engineering	7	Description of the Proposed Project/Proposed Action and Alternatives; Document Review: Power Production and Energy

Table 38-1
California Department of Water Resources Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Tom Boullion	Environmental Scientist	A.A. Biology; A.S. Experimental Statistics; B.S. Zoology; M.S. Zoology	35	Aquatic Biological Resources
Josh Brown	Environmental Scientist	B.S. Range Ecology	5	Aquatic Biological Resources
Koll Buer	Engineering Geologist	B.S. Geology; M.S. Geology	37	Fluvial Geomorphology and Riparian Habitat
Barbara Castro	Environmental Scientist	B.A. Biology; M.A. Environmental Planning; M.S. Botany	36	Botanical Resources, Wetlands and Other Waters of the U.S.
Julia Delphia	Engineer, Water Resources	B.S. Civil Engineering	26	Surface Water Resources, Flood Control and Management; GIS
Karen Dove	Environmental Scientist	B.S. Marine Biology; M.S. Environmental Management	1	Environmental Compliance and Permit Summary; appendixes for the No Project/No Action Alternative
Kim Gazzaniga	Senior Environmental Scientist	B.S. Zoology	10	Public Health and Environmental Hazards
Margie Graham	Environmental Scientist	B.A. Geography and Planning; M.A. Geography	15	Recreation Resources
Alison Groom	Research Analyst II (GIS)	B.S. Geography (Cartography); Special Studies Certification (GIS)	14	Graphics Support
Karyn Heim	Engineer, Water Resources	B.S. English; B.S. Civil Engineering	10	Surface Water Resources; Flood Control and Management
Todd Hillaire	Senior Engineer, Water Resources	B.S. Civil Engineering	22	Document Review: Surface Water Resources, Flood Control and Management
Ralph Hinton	Environmental Program Manager (Retired)	B.A. Wildlife Conservation	51	Recreation Resources
Ray Hoagland	Research Manager III (General)	B.A. Economics; B.A. Mathematics	36	Document Review: Socioeconomics
Millie Hocking Cowley-Crawford	Engineer, Water Resources	A.S. Environmental Engineering; B.S. Environmental Engineering	10	Public Services and Utilities
Perry LeBeouf	Environmental Scientist	B.S. Biology	16	Groundwater Quality
Aric Lester	Environmental Program Manager	B.S. Biological Conservation	15	Aquatic Biological Resources
Katherine Marquez	Environmental Scientist	B.S. Animal Biology; M.S. Biological Conservation	4	Public Health and Environmental Hazards

Table 38-1
California Department of Water Resources Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Jenny Marr	Senior Engineer, Water Resources	B.S. Civil Engineering	10	Description of the Proposed Project/Proposed Action and Alternatives; Flood Control and Management
Scott McReynolds	Senior Environmental Scientist	B.S. Biological Science	15	Surface Water Quality
Jon Mulder	Engineering Geologist	B.A. Geology Professional Geologist # 3959; Certified Engineering Geologist #1352	30	Geology, Minerals, and Soils; Faults and Seismicity
Glen Pearson	Engineering Geologist (Retired)	B.A. Geology	39	Document Review: Fluvial Geomorphology and Riparian Habitat; Groundwater Resources; Faults and Seismicity
Tiffany Schmid	Associate Environmental Planner-Archaeology	M.A. Anthropology; R.P.A.	7	Cultural Resources
Andrew Schwarz	Senior Engineer, Water Resources	B.S. Civil Engineering; M.S. Environmental Planning; Graduate Certificate in Water Policy	9	Climate Change and Greenhouse Gas Emissions; Document Review: Power Production and Energy
Debbie Spangler	Engineering Geologist	B.S. Geosciences; M.S. Geosciences (Hydrology/Hydrogeology)	12	Groundwater Resources

38.3 Federal

Table 38-2 lists the staff from Reclamation who contributed to the preparation of this DEIR/EIS.

Table 38-2
U.S. Bureau of Reclamation Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Alex Aviles	Student Assistant	B.A. Environmental Studies	1	Document Review: Navigation, Transportation, and Traffic; Public Health and Environmental Hazards
Susan Black	Social Science Analyst	B.A. Economics	28	Document Review: Socioeconomics; Environmental Justice

Table 38-2
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Name	Title	Qualifications	Years of Experience	Role
Carolyn Bragg	Natural Resources Specialist	B.S. Earth Systems Science and Policy	5	Document Review: Executive Summary; Introduction; Alternatives Analysis; Land Use; Environmental Justice; Noise; Public Services and Utilities; Relationship Between Short-Term Uses and Long-Term Productivity; Irreversible or Irretrievable Commitments of Resources; Environmental Compliance and Permit Summary; Consultation and Coordination
Bob Colella	Water Rights Specialist	B.S. Electrical Engineering; M.B.A.; J.D.	12	California Water Rights Review
James Cornwell	Hydraulic Engineer	B.S. Civil Engineering	33	Document Review: Surface Water Resources; Power Production and Energy
Tom Fitzhugh	Water Resources Modeler	M.S. Environmental Monitoring	14	CalSim Model Assumptions Review; Document Review: Surface Water Resources
Lisa Fotherby	Hydraulic Engineering	B.S. Civil Engineering; M.S. Civil Engineering; Ph.D. Civil Engineering	20	Document Review: Fluvial Geomorphology and Riparian Habitat
Blair Greimann	Hydraulic Engineering	B.S. Civil Engineering; M.S. Civil Engineering; Ph.D. Civil Engineering	13	Document Review: Fluvial Geomorphology and Riparian Habitat
Lenny Grimaldo	Fisheries Biologist	B.S. Wildlife and Fisheries Biology; M.S. Marine Biology; Ph.D. Ecology	18	Document Review: Aquatic Biological Resources
John Hannon	Fisheries Biologist	B.S. Aquatic Ecology	22	Document Review: Aquatic Biological Resources
Shelly Hatleberg	Natural Resources Specialist	B.S. Environmental Studies; M.S. Biology	19	Document Review: Terrestrial Biological Resources; Visual Resources
Victor Huang	Hydraulic Engineering	B.S. Civil Engineering; M.S. Civil Engineering; Ph.D. Civil Engineering	11	Document Review: Fluvial Geomorphology and Riparian Habitat
Bradley Hubbard	Natural Resources Specialist	B.A. Environmental Studies	19	Document Review: Navigation, Transportation, and Traffic
Mary Johannis	Deputy Regional Planning Officer	B.S. Civil Engineering	35	Document Review: Power Production and Energy
Tom Kisanuki	Fish Biologist	B.S. Wildlife and Fisheries Biology; M.S. Natural Resources	32	Document Review: Aquatic Biological Resources
George Matanga	Hydraulic Engineer	B.S. Civil Engineering; M.S. Civil Engineering; PhD. Civil Engineering - Hydrology	35	Document Review: Groundwater Resources

Table 38-2
U.S. Bureau of Reclamation Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Andrea Meier	Natural Resources Specialist	B.S. Environmental Toxicology; M.A. Public Policy and Administration	9	Document Review: Botanical Resources; Wetlands and Other Waters of the U.S.; Growth-Inducing Impacts; Cumulative Impacts; Environmental Compliance and Permit Summary
Barry Mortimeyer	Chief Power Operations Division	B.S. Electrical Engineering	38	Document Review: Power Production and Energy
Michael Mosley	Physical Scientist	B.S. Geological and Environmental Science; M.E.S.M. Water Resources Management	5	Document Review: Surface Water Quality; Groundwater Quality
Adam Nickels	Archaeologist	B.S. Anthropology; M.S. Resource Management	15	Document Review: Paleontology; Cultural Resources
Steve Piper	Economist	B.S. Economics; M.S. Agricultural and Natural Resource Economics; PhD. Environmental Economics	27	Document Review: Socioeconomics
Patricia Rivera	Native American Affairs Program Manager	B.A. Native American Studies; M.S. Native American Studies; J.D.	15	Indian Trust Assets
Omid Rowhani	Economist	B.E. Economics; M.S. Agricultural and Resource Economics	4	Document Review: Socioeconomics
Scott Springer	Outdoor Recreation Planner	B.S. Wildland Recreation Management		Document Review: Recreation Resources
Alan Stroppini	General Engineer	B.S. Civil Engineering; M.S. Civil Engineering;	30	Document Review: Flood Control and Management
Joel Sturm	Geologist	B.S. Geology; M.S. Geotechnical Engineering; Professional Geologist; Certified Engineering Geologist	37	Document Review: Geology, Soils, and Minerals; Faults and Seismicity
Michael Tansey	Regional Climate Change Coordinator	B.S. Agricultural Science; M.S. Hydrology; Ph.D. Hydrologic Science	37	Document Review: Climate Change and Greenhouse Gas Emissions
Bill Taylor	Economist	B.S. Agricultural Economics; M.S. Agricultural Economics; Ph.D. Agricultural Economics	26	Document Review: Socioeconomics
James Taylor	Natural Resources Specialist	B.S. Chemistry	14	Document Review: Air Quality; Climate Change and Greenhouse Gas Emissions
Bonnie VanPelt	Natural Resources Specialist	B.S. Biology/Ecology; M.S. Environmental Sciences	20	Document Review: Aquatic Biological Resources; Flood Control and Management

Table 38-2
U.S. Bureau of Reclamation Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Elizabeth Vasquez	Natural Resources Specialist	B.S Biology; M.S. Environmental Science and Management	15	Document Review: Consultation and Coordination
Russ Yaworsky	Operations	B.S. Geological Science	33	Temperature Modeling Review

38.4 Sites Project Joint Powers Authority

The Sites Project Joint Powers Authority (SPJPA) consists of the following organizations: Glenn-Colusa Irrigation District, Maxwell Irrigation District, Reclamation Dist 108, Tehama-Colusa Canal Authority, and Yolo Flood Control and Water Conservation District. Table 38-3 lists the staff from those organizations who contributed to the preparation of this DEIR/EIS.

Table 38-3
Sites Project Joint Powers Authority Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Glenn-Colusa Irrigation District				
Thaddeus Bettner	General Manager	B.S. Agricultural Engineering; Licensed Civil Engineer	22	Document Review, Consultation and Coordination
Maxwell Irrigation District				
Daniel Ruiz	General Manager	B.S. Business Administration: Accountancy	7	Document Review, Consultation and Coordination
Reclamation District 108				
Lewis Bair	General Manager	B.S. Agricultural Engineering; Licensed Civil Engineer	18	Document Review, Consultation and Coordination
Tehama-Colusa Canal Authority				
Jeffrey Sutton	General Manager	B.S. Economics, J.D.; Member of California State Bar	14	Document Review, Consultation and Coordination
Yolo Flood Control and Water Conservation District				
Tim O'Halloran	General Manager	B.S. Agricultural Engineering	24	Document Review, Consultation and Coordination

38.5 Consultants

Provided below are the consultants who contributed to the preparation of this DEIR/EIS.

38.5.1 CH2M HILL

Table 38-4 lists the staff from CH2M HILL who contributed to the preparation of this DEIR/EIS.

Table 38-4
CH2M HILL Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Robert Leaf, P.E.	Senior Project Manager; Modeling Task Manager	B.A. Forest and Resource Management; B.S. Civil Engineering; M.S. Water Resources Management	17	Water Resources Engineering, Operations, Physical, Fisheries, and Economics Modeling; Description of the Proposed Project/Proposed Action and Alternatives; Document Review
Wendy Haydon	Environmental Planner	B.A. Environmental Studies; M.S. Recreation Administration	25	EIR/EIS Task Manager; Introduction; Guide to the Resources Analyses; Land Use; Environmental Justice; Public Health and Environmental Hazards; Public Services and Utilities; Relationship Between Short-Term Uses and Long-Term Productivity; Irreversible or Irretrievable Commitments of Resources; Growth-Inducing Impacts; List of Preparers and Contributors; Document Review
Titi Ala	Environmental Planner I	B.A. Environmental Studies: Planning and Policy	1	Land Use
Lucas Bair	Resource Economist	B.A. Forestry; M.S. Agricultural and Resource Economics	12	Economics Modeling and Socioeconomics
Mark Bastasch	Acoustical Engineer	B.S. Environmental Engineering; M.S. Environmental Engineering	15	Noise
Maly-Ann Bory	Civil Engineer	M.S. Civil Engineering	5	Transportation and Traffic
Louise Brown	Environmental Engineer	M.S. Environmental Science and Engineering	15	Noise
Gwendolyn Buchholz	Vice President	B.A. Physics; M.S. Civil Engineering	37	Growth-Inducing Impacts; Cumulative Impacts; Document Senior Review
Chandra Chilmakuri	Water Resources Engineer	B. Tech. Civil Engineering; M.S. Civil and Environmental Engineering; Ph.D. Environmental Hydraulics	8	Operations/Physical Modeling, Fisheries Modeling

Table 38-4
CH2M HILL Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Catherine Clark	Cultural Resource Specialist	M.S. Geography	3.5	Geographic Information System (GIS) Support
Amy Clymo	Air Quality Engineer	B.S. Environmental Toxicology; M.S. Civil and Environmental Engineering	10	Air Quality
Deborah Dagang	Principal Project Manager	B.S. Civil Engineering; M.S. Civil Engineering (Infrastructure Planning and Management)	25	Transportation and Traffic
Tyson Daus	Graphic Designer	B.S. Graphic Design	12	Graphics Support
Holly Dawley	Water Resources Engineer	B.S. Agricultural and Biosystems Engineering	13	Navigation
Raena DeMaris	GIS Specialist	B.A. Anthropology; GIS Certificate	13	GIS Support
Jessica Golman	Environmental Planner	B.A. Psychology; M.S. Environmental Science and Management	2	Visual Resources; GIS
Harmony Gugino	Environmental Planner	B.S. Urban and Regional Analysis/Planning	1	Land Use
Steve Hatchett	Senior Economist	B.S. Forestry; M.A. Environmental Administration; Ph.D. Agricultural Economics	30	Economics Modeling; Socioeconomics
Sharon Karlesky	Environmental Engineer	B.S. Civil Engineering; M.S. Water Resources Engineering	6	Public Health and Environmental Hazards
Stephen Layton	Environmental Planner	B.S. Environmental Science; M.L.A. (Masters of Landscape Architecture)	4	Socioeconomics
Duncan MacEwan	Economist	B.S. Mathematical Economics and Economic Theory; M.S. Agricultural and Resource Economics; Ph.D. Economic Geography	5	Socioeconomics
Chakri Malakpet	Water Resources Engineer	M.S. Civil Engineering	5.5	Operations/Physical Modeling
Nancy Michaelis-Kerhlikar	Document Designer		21	Document Design
Heather Rand	Technical Editor	B.A. Spanish	15	Editor; References
Randy Ritzema	Associate Engineer	B.S. Engineering (Mechanical); M.S. International Agriculture Development; M.S. Civil and Environmental Engineering; Ph.D. Biological Systems Engineering	12	Operations/Physical Modeling
Grahm Satterwhite	Transportation Engineer	B.S. Civil Engineering	6	Transportation and Traffic

Table 38-4
CH2M HILL Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Jennifer Scholl	Environmental Scientist	B.A. Environmental Studies and Political Science International Relations	23	Environmental Justice
John Schoonover	Environmental Planner	B.S. Environmental Science	12	Land Use; Visual Resources
Ashraf Shaqadan	Water Staff Engineer	M.S. Biological and Irrigation Engineering; Ph.D. Water Resources Engineering;	4	Operations/Physical Modeling
Mieke Sheffield	Environmental Planner	B.S. Environmental Science; M.S. Environmental Science	7	Land Use
Geof Spaulding	Paleontological Resources Specialist	B.A. Anthropology; M.S., Ph.D. Paleobiology/Paleoecology	37	Paleontology
Elizabeth Storelli	Environmental Scientist	B.S. Environmental Science	3	Air Quality
Derya Sumer	Associate Engineer	B.S. Civil Engineering; M.S. Civil Engineering; Ph.D. Civil Engineering	5	Operations/Physical Modeling
Mathew Trask	Senior Project Manager	A.S. Engineering; B.A. Science Journalism	28	Power Production and Energy
Lisa Valdez	Environmental Planner	B.A. Environmental Studies; M.C.R.P City and Regional Planning	15	Executive Summary; Relationship Between Short-Term Uses and Long-Term Productivity; Irreversible or Irretrievable Commitments of Resources; Growth-Inducing Impacts; Mitigation Monitoring Plan
Pamela Vanderbilt	Air Quality Scientist	B.S. Biology; M.A. Biology	31	Air Quality
Brian Van Lienden	Water Resources Engineer	B.S. Civil & Environmental Engineering; M.S. Civil & Environmental Engineering	11	Operations/Physical Modeling
James Verhoff	Staff Paleontologist	B.S. Geology (specialization in Paleobiology)	1.5	Paleontology
Fatuma Yusuf	Senior Economist	B.S. Range Management; M.A. Agricultural Economics; M.S. Statistics; Ph.D. Agricultural Economics	16	Socioeconomics; Public Services and Utilities

38.5.2 Cardno ENTRIX

Table 38-5 lists the staff from Cardno ENTRIX who contributed to the preparation of this DEIR/EIS.

Table 38-5
Cardno ENTRIX Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Steve Pavich	Senior Economist	B.A. Economics; M.S. Agricultural and Resource Economics	14	Economics Modeling and Socioeconomics

38.5.3 Cramer Fish Sciences

Table 38-6 lists the staff from Cramer Fish Sciences who contributed to the preparation of this DEIR/EIS.

Table 38-6
Cramer Fish Sciences Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Paul Bergamn	Fisheries Biologist	B.S. Limnology, M.S. Fisheries	8	Fisheries Modeling
Brad Cavallo	Senior Scientist	B.S. Fisheries Biology, M.S. Aquatic Ecology	17	Fisheries Modeling
Steven Zeug	Fisheries Biologist	B.S. Fisheries Biology, Ph.D. Wildlife and Fisheries Sciences	10	Fisheries Modeling

38.5.4 ESSA Technologies, Ltd.

Table 38-7 lists the staff from ESSA Technologies, Ltd. who contributed to the preparation of this DEIR/EIS.

Table 38-7
ESSA Technologies, Ltd. Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Clint Alexander	Managing Partner/Team Leader	B.S. Ecology; M.R.M (Master of Resource Management)	15	Sacramento River Ecological Flows Tool (Sac EFT) Report
Frank Poulsen	Quantitative Ecologist/Programmer	M.S. Engineering (Environmental and Computer Science)	9	Sac EFT Report
Don Robinson	Senior Systems Ecologist	B.S. UBC M.S. UBC	29	Sac EFT Report

38.5.5 HDR, Inc.

Table 38-8 lists the staff from HDR, Inc. who contributed to the preparation of this DEIR/EIS.

Table 38-8
HDR, Inc. Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Jelica Arsenijevic	Environmental Scientist II – Aquatic Resources	B.S. Environmental Biology/Ecology	8	Aquatic Biological Resources
Heather Bowen	Biologist I	B.S. Fishery Sciences	5	Aquatic Biological Resources
Paul Bratovich	Principal Scientist	B.S. Fisheries; M.S. Fisheries Resources	30	Aquatic Biological Resources
Morgan Neal	Biologist II	B.S. Fisheries Biology; M.S. Marine Affairs	6	Aquatic Biological Resources
Jose Perez-Comas	Senior Scientist	Sc.D. Fishery Sciences; M.S. Fishery Sciences; Ph.D. Fishery Sciences	34	Aquatic Biological Resources
Adrian Pitts	Senior Environmental Scientist	B.S. Biological Sciences	14	Aquatic Biological Resources
Cristina Ramirez	Environmental Scientist 1	B.S. Environmental Policy and Management	4	Aquatic Biological Resources
Amanda Ransom	Associate Environmental Planner	B.S. Environmental Policy/Planning	8	Aquatic Biological Resources
Dianne Simodynes	Senior Environmental Scientist	B.S. Biological Sciences; M.S. Aquatic Resource Management	18	Aquatic Biological Resources

38.5.6 RMEcon

Table 38-9 lists the staff from RMEcon who contributed to the preparation of this DEIR/EIS.

Table 38-9
RMEcon Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Roger Mann	Principal	Ph.D. Agricultural Economics and Economics	34	Economics Modeling

38.5.7 The Nature Conservancy

Table 38-10 lists the staff from The Nature Conservancy who contributed to the preparation of this DEIR/EIS.

Table 38-10
The Nature Conservancy Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Ryan Luster	Project Director-Sacramento River Project	B.A. Environmental Biology; M.S. Rangeland Ecology	17	Document Review: Sac EFT Report

38.5.8 URS

Table 38-11 lists the staff from URS who contributed to the preparation of this DEIR/EIS.

Table 38-11
URS Staff Contributors to the DEIR/EIS

Name	Title	Qualifications	Years of Experience	Role
Joseph Barnes	Water Resources Engineer	B.S. Civil Engineering; P.E.	41	Engineering
Nik Carlson	Senior Economist	M.A. Philosophy, Politics and Economics; M.P.P. Public Policy.	21	Socioeconomics
Janis Offermann	Senior Cultural Resources Specialist	B.A. Anthropology; M.A. Anthropology	36	Cultural Resources

39. EIR/EIS Distribution List

39.1 Document Availability

This chapter provides an overview of the locations where this Draft EIR/EIS is available for review, and lists the agencies and organizations that received copies of it. The public distribution of this Draft EIR/EIS emphasizes the use of electronic media to ensure cost-effective and broad availability to the public and interested parties. This Draft EIR/EIS is available on the internet on the U.S. Bureau of Reclamation's (Reclamation's) website: http://www.usbr.gov/mp/nodos/, and on the California Department of Water Resources' (DWR's) website: http://www.water.ca.gov/storage/northdelta/. The Draft EIR/EIS is also available for review at the following locations:

Mr. Sean Sou
California Department of Water Resources
901 P Street
Sacramento, CA. 95814
sean.sou@water.ca.gov
Fax: (916) 651-9292

Ms. Sharon McHale
U.S. Bureau of Reclamation
2800 Cottage Way, MP-700
Sacramento CA. 95825
smchale@usbr.gov
Fax: (916) 978-5094

39.2 Agencies and Organizations Receiving a Copy of the Draft EIR/EIS

This list includes agencies and organizations that were involved in the scoping process for the Project, requested a copy of the Draft EIR/EIS, and/or that may use the Draft EIR/EIS for discretionary or informational purposes. DWR and Reclamation continue to solicit input from these entities regarding the Project by encouraging review of this Draft EIR/EIS.

39.2.1 Federal Agencies

- National Marine Fisheries Service
- NOAA Fisheries
- Six Rivers National Forest
- United States House of Representatives
- United States Senate
- U.S. Army Corps of Engineers
- U.S. Bureau of Indian Affairs
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation
- U.S. Department of the Interior, Office of the Solicitor
- U.S. Department of the Interior
- U.S. Department of Justice
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

39.2.2 State Agencies

- Arizona Department of Environmental Quality
- Assembly Republican Caucus
- CALFED Bay-Delta Program
- California Bay-Delta Authority
- California Department of Fish and Game
- California Department of Food and Agriculture
- California Department of Justice
- California Department of Parks and Recreation
- California Department of Transportation

- California Department of Water Resources
- California Regional Water Quality Control Board
- California State Assembly
- California State Clearinghouse
- California State Senate
- Colorado Department of Natural Resources
- Colorado Division of Water Resources
- Congressman Dennis Cardoza
- Congressman George Miller
- Congressman Jerry McNerney
- Congressman Michael Thompson
- Congresswoman Nancy Pelosi
- Idaho Department of Environmental Quality
- Idaho Department of Water Resources
- Kansas Department of Health & Environment
- Montana Department of Environmental Quality
- Montana Department of Fish Wildlife and Parks
- Montana Department of Natural Resources & Conservation
- Nebraska Department of Environmental Quality
- Nevada Department of Administration, Budget and Planning
- Nevada State Clearinghouse
- New Mexico Energy Minerals and Natural Resources Department
- New Mexico Environment Department
- North Dakota Department of Health, Environmental Health Section
- Northern California Power Agency
- Office of Assemblyman Dickerson
- Office of Assemblyman Roger Niello
- Office of Assemblymember Alan Nakanishi
- Office of Assemblymember Anna Caballero
- Office of Assemblymember Anthony Rendon
- Office of Assemblymember Cathleen Galgiani
- Office of Assemblymember Douglas La Malfa
- Office of Assemblymember Joel Anderson
- Office of Assemblymember Juan Vargas
- Office of Assemblymember Patty Berg
- Office of Assemblymember Paul Cook
- Office of Assemblymember Tom Berryhill
- Office of Congressman George Radanovich
- Office of Congressman Sam Farr
- Office of Congressman Tom McClintock
- Office of Congressman Wally Herger
- Office of Congresswoman Doris Matsui
- Office of Representative Wes Chesbro
- Office of Senator Dianne Feinstein
- Office of State Senator Abel Maldonado
- Office of State Senator Charles Calderon
- Office of State Senator Dean Florez
- Office of State Senator Elaine Alquist
- Office of State Senator Joseph Simitian
- Office of State Senator Patricia Wiggins
- Office of State Senator Robert Dutton
- Office of U.S. Senator Barbara Boxer
- Oklahoma Department of Environmental Quality
- Oregon Department of Environmental Quality
- Oregon Water Resources Congress
- Reclamation District No. 70
- Reclamation District No. 108
- Reclamation District No. 1004
- State of California Resources Agency
- State Water Resources Control Board
- Texas Commission on Environmental Quality
- Texas General Lands Office
- Texas Historical Commission
- Texas Office of Budget, Planning and Policy
- Utah Public Lands Policy Coordination Office
- Washington State Department of Natural Resources
- Wyoming Department of Environmental Quality

39.2.3 Regional and Local Entities

- Alameda County Assessor's Office
- Alpine County Board of Supervisors
- Anderson-Cottonwood Irrigation District
- Arvin-Edison Water Storage District
- Association of California Water Agencies
- Bella Vista Water District
- Board of Supervisors, Red Bluff
- Browns Valley Irrigation District
- Butte County Board of Supervisors
- Carter Mutual Water Company
- Centerville Community Services District
- City of Redding
- City of Shasta Lake
- City of West Sacramento
- City of Yuba
- Clear Creek Community Services District
- Colusa Basin Drainage District
- Colusa County
- Colusa County Board of Supervisors
- Colusa County Farm Bureau
- Colusa County Water District
- Colusa Drain Mutual Water Company
- Colusa Indian Community Council
- Colusa Rancheria
- Contra Costa County Board of Supervisors
- Contra Costa Water District
- Cortina Indian Rancheria
- Cortina Water District
- Davis Water District
- Del Norte County Board of Supervisors
- Delta Diablo Sanitation District
- Delta Stewardship Council
- Diablo Sanitation District
- Dunnigan Water District
- East Bay Municipal Utility District
- El Dorado County Board of Supervisors
- Feather Water District
- Fresno County
- Fresno County Board of Supervisors
- Fresno County Farm Bureau
- Friant Water Authority
- Glenn County
- Glenn County Board of Supervisors
- Glenn Valley Water District
- Glenn-Colusa Irrigation District
- Grasslands Water District
- Grindstone Rancheria
- Hoopa Valley Tribal Fisheries Department
- Hoopa Valley Tribe
- Humboldt County Board of Supervisors
- Imperial County Board of Supervisors
- Jackson Rancheria
- Kanawha Water District; Glide Water District
- Kern County Board of Supervisors
- Kern County Water Agency
- Kings County Board of Supervisors
- La Grande Water District
- Lassen County Board of Supervisors
- Madera County Board of Supervisors
- Madera Irrigation District
- Maxwell Irrigation District
- Maxwell Unified School District
- Metropolitan Water District of Southern California
- Modesto Irrigation District
- Modoc County Board of Supervisors
- Mountain Gate Community Services District
- Napa County Board of Supervisors
- Natomas Central Mutual Water Company
- Nevada County Board of Supervisors
- Northern California Water Association
- Orland Unit Water Users' Association
- Pacheco Water District
- Paskenta Band of Nomelaki Indians
- Placer County Board of Supervisors
- Pleasant Grove-Verona Mutual Water Company
- Pleasant Valley Water District
- Plumas County Board of Supervisors
- Princeton-Cordora-Glenn Irrigation District
- Proberta Water District
- Provident Irrigation District
- Redding Rancheria
- Regional Council of Rural Counties
- Robinson Rancheria Band of Pomo Indians
- Ramsey Rancheria of Wintun Indians
- Sacramento Area Flood Control Agency

- Sacramento County
- Sacramento County Board of Supervisors
- Sacramento Municipal Utility District
- San Benito County Water District
- San Francisco Public Utilities Commission
- San Joaquin County Board of Supervisors
- San Juan Water District
- San Luis & Delta Mendota Water Authority
- San Luis Obispo County Board of Supervisors
- Santa Barbara County Board of Supervisors
- Santa Clara Valley Water District
- South Dakota Department of Environment & Natural Resources
- Shasta Community Services District
- Shasta County Board of Supervisors
- Shasta County Library
- Shasta County Water Agency
- Sierra County Board of Supervisors
- Siskiyou County Board of Supervisors
- Sites Project Joint Powers Authority
- Solano County Board of Supervisors
- South Delta Water Agency
- South San Joaquin Irrigation District
- Stockton East Water District
- Stony Creek Water District
- Sutter Mutual Water Company
- Swinford Tract Irrigation District
- Tehama County Board of Supervisors
- Tehama County Flood Control and Water Conservation District
- Tehama-Colusa Canal Authority
- Thomes Creek Water District
- Trinity County Board of Supervisors
- University of California Riverside
- Upper Lake Band of Pomo Indians
- Ventura County Board of Supervisors
- Western Area Power Administration
- Westlands Water District
- Yolo County
- Yolo County Board of Supervisors
- Yolo County Flood Control & Water Conservation District

39.2.4 Other Interested Parties

- 1998 Family Revocable Trust (Lockett Trust)
- A and R Farms
- Adams Broadwell Joseph and Cardozo
- Adesa California, LLC
- Advertising Age - Chicago Bureau
- Ag Alert
- Agriculture Industries
- Allstar Realty
- Altamont Raceway Park
- Altshuler Berzon LLP
- American River Parkway Foundation
- Andreotti, et. al.
- Arcus Data Security, Inc.
- Arnaudo Bros
- Associated Press
- Associated Press (AP) - Sacramento Bureau
- Associated Press (AP) - San Francisco Bureau
- Auburn Journal
- Baker Farming, Inc.
- Bakersfield Californian, The
- Battle Mountain Bugle
- Bay Institute, The
- Beauchamp Ranch
- Benicia Herald
- Bookman-Edmonston Engineering, Inc.
- Borges Bros
- Brown and Caldwell
- Bulletin, The
- Butte Environmental Council
- C/O Ms. Mary Wells
- California Center for Public Dispute Resolution
- California Delta Protection Commission
- California Environmental Insider
- California Farm Bureau Federation
- California Farm Water Coalition
- California Outdoor Heritage Alliance
- California Watch, Online News

- California Water Impact Network
- California Water News Blog, The
- California Waterfowl Association
- Capital Press
- Capitol Morning Report
- Capitol Weekly
- Carnazzo Land Company
- CBS Action 12 News at 6:30 PM - KHSL-TV
- CDM
- Central Valley Business Times
- Central Valley Project Water Association
- CH2M HILL
- Chef's Talk - KLXR-AM
- Cheng Children Properties
- Chico Enterprise Record
- Chowchilla News
- Christy Concrete Products, Inc.
- Community Alliance Newspaper
- Conti Corp
- Corcoran Journal
- Costco Wholesale Corporation
- Crossroads Business Center, LP
- Daily Republic
- Davis Enterprise, The
- Delta Properties, PTP
- Diepenbrock Harrison Law Firm
- Ducks Unlimited
- Earthjustice
- EIP Associates
- Entercom Radio
- Environmental Defense Fund
- Environmental Science Associates
- Equilon Enterprises, LLC
- ESA
- Fabian Ranch, LLC
- Family Farm Alliance
- Fish Sniffer
- Folsom Telegraph, The
- Forry Orchards
- Fox 40 News at 10 PM - KTXL-TV
- Fresno Bee, The
- Friends of the River
- Friends of the Trinity River
- Frost, Krup and Atlas
- G & L Farms
- GEI Consultants
- Gerald Costa Separate Trust
- Glenn Co. Water Advisory Committee
- Glenn County Farm Bureau
- Granite Bay Press-Tribune
- Grassland Wetlands
- Griffin, et. al.
- Grover L. Davis Family Rev. Trust
- Hall, Estill
- Hanford Sentinel
- Hanford Sentinel
- Hanford Sentinel, The
- HDR - The Hoyt Company
- Henle Family Limited Partnership
- Hershey Land Company
- Herzog Group, Inc., The
- Hoffman Silver Gilman & Blasco P.C.
- J B Unlimited, Inc.
- Joseph Griffin, et.al.
- Kaweah Commonwealth
- KBLF-AM (Timeless Favorites)
- KCRA
- KCRA NBC Channel 3
- KCRA-TV
- KEDR-FM (Family Radio)
- Kerwest Incorporated
- KFTV-TV
- KGMC-TV
- KGO-AM (News Talk AM 810)
- KGO-TV
- KGPE-TV
- KIDE-FM (KIDE Radio)
- Kiewitt Pacific Company
- Klamath Basin Crisis
- KLIB-AM 1110
- KMGV-FM (MEGA 97.9)
- KMUD-FM (KMUD Radio)
- KNCI-FM (KNCI 105.1)
- KNCQ-FM (Q97 FM)
- KNTV-TV
- KNVN-TV
- KNXT-TV
- KOVR-TV
- KP Public Affairs
- KPAY-AM (News Talk 1290)
- KPIX-TV

- KQCA-TV
- KQED
- KQED Public Radio
- KRCR-TV
- KRCX-FM (Tricolor 99.9)
- Kronick Moskovitz Tiedemann & Girard
- KSEE-TV
- KSOF-FM (Soft Rock 98.9)
- KSPX-TV
- KTTA-FM 97.9
- KTVU-TV
- KVIP-AM (KVIP 520)
- KVPR-FM (FM 89 Valley Public Radio)
- KXPR-FM (Capital Public Radio)
- KXSE-FM (Jose 104.3)
- KYMX-FM (Mix 96)
- KZFR-FM 90.1
- Laer Pearce and Associates
- Lahontan Valley News
- Lake California Property Owners Association Inc
- Larrabee Farms
- Law Offices of Michael A. Brodsky
- Lemos Ranch
- Lodi News-Sentinel
- Los Angeles Times
- M and T Chico Ranch
- Madera Tribune
- Manteca Bulletin
- Marketplace - American Public Media
- MarketWatch.com Radio Network
- MBK Engineers
- McClatchy Company Washington DC Bureau
- Meridian Farms Water Company
- MH Pegasus Ventures, LLC
- Mid Valley Publishing
- Midway Power, LLC
- Modesto Bee, The
- Mulqueeney Ranch Properties
- MWH
- Myers-Marsh Mutual Water Company
- Napa Valley Register
- Natural Heritage Institute
- Natural Resources Defense Council
- New York Times, The
- Nomellini Grilli and McDaniel Professional Law
- Oakdale Leader
- Oakland Tribune
- Odysseus Farms
- Odysseus Farms Partnership
- Orange County Register - State Capitol Bureau
- Oregonian, The
- Overton Orchards
- Pacific Advocates
- Pacific Coast Federation of Fishermens Association
- Pacific Gas and Electric Company
- Pacific Satellite Connection
- Packer, The
- Patterson, LLC
- Paul Locvich
- Pelger Mutual Water Company
- Planning and Conservation League
- ProLogis
- Public Policy Institute of California
- Quad-H Ranches, Inc.
- R and A Chesney Family Trust
- Radonich Investment, Inc.
- Record, The
- Red Bluff Daily News
- Reporter, The
- Republican Fiscal Office
- Resources Agency
- Rice Producers of California
- Richard Denton & Associates
- Richard Giusti, et al.
- Richter Brothers
- River Garden Farms Company
- Riverby Limited Partnership
- Riverview Golf and Country Club
- Roberts Ditch Irrigation Company, Inc.
- Roberts Ditch Irrigation Company, Inc.
- Russell Young Farms
- Ruth Ann Spence, Spence Farms
- Sacramento Bee - Online, The
- Sacramento Bee, The
- Sacramento River Preservation Trust
- Sacramento River Water Contractors Association

- San Diego Tribune
- San Francisco Chronicle
- San Francisco Daily Journal
- San Joaquin Delta College
- San Joaquin River Exchange Contractors Water Authority
- San Jose Mercury News
- Santa Barbara News-Press - Lompoc Bureau
- Sierra Booster
- Sierra Club
- Sites Ranch
- Sonora Union-Democrat
- State Water Contractors
- TCCA
- Teichert Aggregate
- The Associated Press
- The Business Journal Fresno
- Thun and Collins Farms
- Tisdale Irrigation and Drainage Company
- Tracy Industrial, PTP
- Trinity Journal
- Two Rivers Tribune
- Union Pacific Railroad Company
- United Facilities, Inc.
- Univision Television Network
- U-T San Diego - Sacramento Bureau
- Van Ruiten Bros.
- Vida En El Valle
- Visalia Times-Delta
- Water Agency, Inc.
- Water Education Foundation
- Water Resources Center Archives
- West Cost Products, LLC BP
- Western Farm Press
- Western Fruit Grower
- Western Resources, Inc.
- Wildlands, Inc
- Wilson Ranch Partnership
- Yubanet

39.2.5 Individuals

- Aguiar, Gabrial
- Aguilar, Joe C. and Arlene M.
- Albers, Monte R and Lucia
- Albert, Marc
- Alcid, Piper
- Aleck, Betty
- Alexander, Thomas
- Almeida, Frank
- Alvernaz, Alan
- Andersen, Victor and Jean
- Anderson, Raymond
- Andreotti, Arnold
- Aofonf, Tausher
- Archuleta, Gary
- Arledge, David
- Arnold, John
- Aroner, Dion
- August, Manuel
- Avila, Jose A. and Josefina
- Avila, Laverne
- Azevado, Allan
- Bailey, Nadine
- Baker, Carol
- Barrett, Manuel
- Barrow, Delbert and R June
- Bass, Karen
- Beam, John
- Beck, Allan
- Beckley, Ralph
- Behling, Bryan
- Beller, Garrett and Margie
- Bennert, Jason
- Berven, David M and Lizbeth B
- Bettencourt, Frank and Mary
- Black, Kris
- Blake, Cary
- Bomar, Ernest
- Bonnie Vivian L Trust,
- Bosler, Keely
- Boyd, S
- Boyd, S Dina
- Bridges, Charles and Andrea
- Briggs, Michael
- Brobeck, James

- Brockman, William and Kathleen
- Brown, Carrie
- Bryne, John
- Buckley, Ralph
- Burkholder, Brad
- Burley, Silvia
- Burnett, Jr., Donald
- Burroughs, Ashlie
- Butler, James Q. and Deborah E.
- Butler, Kerry and Jill Lee
- Butler, Leslie
- Caenoct, Cecil and Shirley
- Camara, Mark A and DJ
- Campodonico, Albert H and Anthony
- Cardenas, Tony
- Cardoza, Manuel
- Cardozo, Dan
- Carlson, Heinz and Gisele
- Caron, James and Deborah
- Carter, Jane
- Carvalho, Manuel
- Castello, Anthony J and Phyllis H
- Castello, Melvin
- Chambers, Barry and Susan
- Chedester, Steve
- Chernick, Gerald
- Cherovsky, Regina
- Chung, Francis
- Churkin, Michael
- Ciabattari, Maria
- Cibula, Mark
- Clark, Freddie L and Obie J
- Clark, Scott
- Clark, Steven
- Clifton, James
- Coleman, Michon
- Condon-Johnson, James
- Conner, Kevin and Deborah
- Conner, Vernon
- Cook, Walter
- Corbett, Ellen
- Corbin, George and Linda
- Corbin, Lorraine
- Cordoza, Joseph and Clivia R
- Corona, Samuel S. and Anita P.
- Costa, Evelyn and Serventi Edwina
- Costa, Jerry and Glenice
- Costanzo, William and Virginia
- Courtright, Tom and Jacquie
- Cowin, Mark
- Cunha, Roy
- Cunningham, Cindy
- Daniell, Harry
- Dauer, Bob and Sharon
- Davis, Arnold and Joyce
- Davis, et. al., Olive
- Davis-Wirth, Marilyn
- Deetz, John L and Lynette M.
- DeHain, Tom
- Dehoyos, Eloise
- Dehoyos, Ricardo and Karen
- Deni, Charles
- Dennis, Lincoln
- Dennis, Steven
- deReus, Lenus
- Devaney, Winifred
- Dexter, Albert F and Mike J
- Dias, Wyatt
- Dicherico, Betty
- Dietrich, Nathan
- Digges, Margaret
- Doherty, Maureen
- Driver, Gary
- Driver, John A & Clare M
- Driver, William
- Dunlap, Charles
- Duren, Glen
- Dutton, Robert
- Dykzeul, Adrian A and Suzanne M
- Easton, Stewart and SL
- Edson, Wallace
- Edwards, Charles and Ann
- Egan, Jean and Mildred
- Eggleston, Ronald
- Ehrke, Allen
- Eichhorn, Francis
- Eiden, Richard and Elaine
- Elliott, Francis
- Ellis, Tom and Rose Ann
- Enos, Martin M. and Jean H.
- Enos, William
- Etchepare, Allen

- Evans, Peter W and Jennifer
- Farro, Mitch
- Felix, Anthony
- Field, Robert
- Flores, Karen
- Flynn, Eugene
- Folsom, Douglas and Eloisa M
- Foskett, Matt
- Franco, Henry V and Anita A
- Franson, Paul
- Frates, Donald J. and Maria L.
- Fredenburg, Bob
- Freeman, Catherine
- Fries, Walter and Lyla
- Frudden, Joanne
- Furlan, Emile
- Gage, Larry
- Gallegos, Joe S and Veronica C
- Gatehouse, Lois
- Ghorbani, Armine and Lori
- Gibbons, Byron
- Gillaspy, William & Marilyn
- Gillion, Parminder
- Gilmour, Michael
- Gittelsohn,
- Goddard, Tom
- Goitein, Evan
- Gorman, Kyle
- Goulart, Paul
- Gould, Rob
- Greer, Louis
- Greet, Louis
- Griffith, Gordon L and Marianne B
- Griffith, Tom
- Grunauer, Ralph Jr.
- Guider, Bob and Maria
- Guider, Richard
- Hagman, Curt
- Hall, Edith
- Hall, Wylie F and Mary Ann
- Hansen, Del and Cheryl
- Harbison, Zelda
- Hardy, Jonathan
- Harp, Richard
- Harper, Robert and Carol
- Harris Sr, Chuck
- Harris, Rich and Kathy
- Haug, Palmer
- Haugen, Steve
- Haywood, Kelly
- Henderson, George and Bettey
- Henle, Thomas
- Henneman, Ken
- Henriques, Alfred J and Delores
- Hentz, Christopher
- Herbold, Bruce
- Herger, Wally
- Hernandez, David
- Hernandez, Inocencio
- Herod, Jeanmarie
- Hertzberg, Robert
- Hintz, Lu
- Holder, Barbara
- Hollins, Mariette
- Holt, Benjamin Jr.
- Holthouse, Leo
- Holthouse, Leo
- Hooper, Ross
- Howald, Brad
- Hubble, Dan
- Huettis, Richard
- Huffmaster, David
- Hunt, Janet
- Hurley, Chase
- Hyatt, Carolyn
- Jack, Anthony
- Jackson, Cynthia
- Jacobo, Rober and Dell
- Jaeger, William
- Jaimes, Lorie
- Janiszewski, Gregory
- Jaques, Mario A and Alison M
- Jennings, Bernadine
- Jensen, Dale C. and Lucila
- Jensen, Roberta
- Jess, Joseph J and Connie L
- Jess, Nell
- Johnson, Reed & Sandra
- Johnson, William and Patricia
- Journal, Trinity
- Jurado, John
- Keene, Richard

- Kelley, David
- Kellogg, Debbie
- Kellogg, Robert
- Kimura, Laurence
- King, Ben & Barbara
- King, Mike
- Kittle, Patrick
- Koslosky, Joseph and Janette
- Kusler, Brenda
- La Malfa, Milton
- Lagrange, Fran H.
- Lamee, Howard and Dorothy
- Landers, Bobbie
- Landers, Roberta M.F.
- Landsbergen, L
- Larson, Jeffry and Meliss
- LaValle, Richard and Suzanne
- Leathers, Michael
- Lee, Ronald
- Leiser, Dorothy
- Leschinsky, David and Shelle
- Leschinsky, Gene
- Leschinsky, Joe
- Lesman, Nadine
- Lewis, Steven
- Liggett, Timothy and Mona
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- McGeoghegan, Robert
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- McHenry, Michael
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- Mostofi, Onsori Ardavan
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- Muela, Elias
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- Murphy, Raymond
- Nawi, David
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- Nola, Gerald T and Christine E
- Nolen, Joel L and Shirlee M
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- Nordyke, Lavona
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- Oji, Masonobu
- Oliveira, Isabel
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- Olson, Earl
- Ornellas, Rosa

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- O'sullivan, Jeremiah
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- Owens, Edward
- Pabla, Tejpaul S and Herminder
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- Papan, Lou
- Papouschek, Pappy and Flo
- Patterson, Walter R. Jr. and S
- Patteson, James
- Payne, Kenneth
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- Pearson, Russell
- Peart, Donald
- Penner, Roger
- Perata, Donald
- Petersen, Sadye
- Peutz, Pete and Ann
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- Phillips, Elizabeth
- Phipps, Jeff
- Pinas, Joe
- Pokorny, Richard
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- Pombo, Alfred
- Port, Patricia
- Prater, Sheryl
- Propfe, Annie
- Pujol, Alberto
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- Rayher, William G and Marie M
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- Reische, Laverne
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- Rooney, Brian
- Roper, Stanley
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- Santucci, Louis and D.M.
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- Schreiner, Joseph
- Scolaro, Jan
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- Self, Fred D. and Marie A.
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- Sibert, Timothy
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- Singleterry, Don
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- Sites, Philip
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- Smith, Garland D. and Nora M.
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- Spinardi, Thomas
- Stafford, Bartholomew
- Steffanson, Bob and Joanie

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- Steidlmayer, Francis
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- Sullivan, John
- Sutton, John
- Sutton, Robert
- Tanner, James C & Tina L
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- Thompson, Charles
- Thurman, Jim and Ruth
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- Valencia, Roberto and Glafira
- Van Fossen, Rich and Linda
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- Vann, Angela
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- Wells, Mary
- Weseloh, Tom
- Westfall, Mary
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- Willey, Edwin
- Williams, Billy and Katherine
- Williams, Scott
- Williamson, Cynthia
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- Wright, Roderick
- Zaremba, Thomas
- Zendejas, Jose
- Zettel, Charlene
- Ziehe, John J. and Arlene
- Ziller, Bernard